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. . THE . .

AGRICULTURAL GAZETTE

. . OF . .

NEW SOUTH WALES.

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MINISTER FOR AGRICULTURE.

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1947

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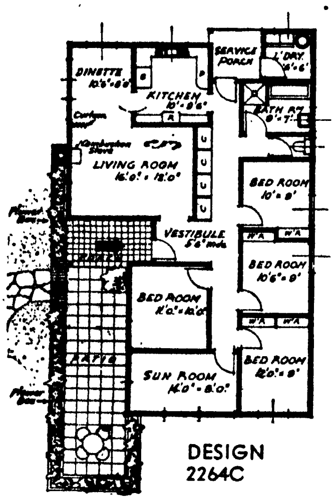

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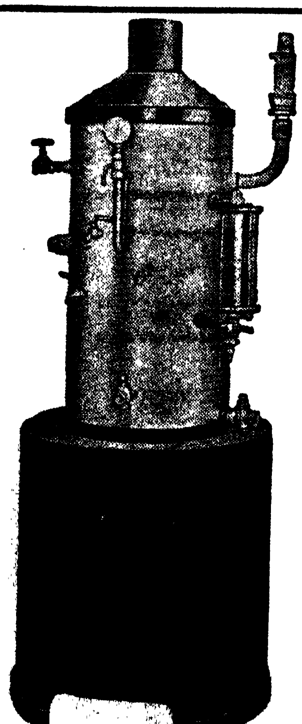

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THE AGRICULTURAL GAZETTE FOR JANUARY, 1947.

This Issue Contains:—

NEW YEAR GREETINGS

From the Minister for Agriculture.

To all who are engaged in the practice of agriculture in any of its many branches I extend my sincere wish that the year 1947 will prove a bounteous one, and that the dark shadow of drought which has for so long hung over our State may disappear. I do this, not only as the Minister for Agriculture of the State, but also as one who has devoted himself to the oldest and most honourable of all human endeavours.

I do desire to stress, however, the recurrence of those periods when the rainfall is below the requirements of crops and stock, even though the area affected and the incidence may vary, and that in consequence it is our duty in normal seasons to make due provision for the safeguard of our asset when we are called upon to face nature's frown.

My journeyings throughout England and Scotland as leader of the Government-sponsored Stock Purchasing Delegation have further convinced me, were such necessary, that in the attainment of success in the raising of stock the two great essentials are breeding and feeding. In every stud and stock raising property I have visited I have found that prime considerations of the owners are the improvement of pastures and the provision of fodder supplies adequate to maintain stock in good condition and full production throughout the long and severe winter months. That it is in this regard that not a few of our own farmers and graziers fall short of their responsibility to themselves cannot be contested.

Shortly I will be leaving for the United States of America and Canada with other members of the Delegation in further pursuance of our important mission, but we are all looking forward to an early return to sunny New South Wales.

The stud stock already purchased represents a substantial contribution to the improvement of the standard of our flocks and herds, and I feel that the Premier's decision, which we are implementing through our tour, will prove of inestimable benefit to the stock-raising industry of the State.

Edinburgh,
Scotland,
December 6, 1946.

E H Graham

Minister for Agriculture.

SEED OATS FOR 1947 SOWING.

Notes on the Varieties Included in the Emergency Plan.

Recommendations for All Purposes.

W. M. CURTEIS, B.Sc.Agr., Senior Agricultural Instructor.

ONLY four varieties of oats, viz., Algerian, Belar, Fulghum and Mulga are included in the emergency plan for the purchase and distribution of seed oats in New South Wales for 1947 seeding—details of which were given in the December issue.

These varieties will suffice for all requirements in any district of the State—whether the farmer desires to use the crop for (a) grazing only, (b) hay or grain, (c) early grazing followed by hay or grain production—provided the right variety is selected for the locality and the proposed use of the crop.

The following brief notes on the value of these varieties for the several purposes and on their distinguishing characteristics will enable the farmer to make a sound choice of varieties to suit his needs.

Varieties for Grazing Only.

Fulghum produces excellent early feed and may be successively grazed well into the early summer months. It is the best grazing oat variety for all districts of the State, when late autumn and winter feed is required. It is not a suitable variety for producing hay or grain crops after grazing, because of its weak straw and susceptibility to oat smut.

Algerian is late maturing, and therefore is best suited for the districts of good rainfall such as the coast, tablelands and higher portions of the slopes. It does not produce the bulk of early fodder that Fulghum yields, but excels that variety in spring and early summer grazing.

Varieties for Hay or Grain.

Algerian produces a good quality hay and medium quality grain, and is the most suitable variety for these purposes on the tablelands and higher portions of the slopes districts. It is too late maturing for the main wheat areas.

Belar is the best variety for hay or grain in the main wheat areas of moderate rainfall. The straw is tall, not coarse, and moderately strong, producing a good quality hay and chaff. The grain is of good quality and of an even grade for milling purposes.

Mulga is a very early maturing variety and is only suited for the drier areas in the western plains. Both the hay and grain are of medium quality, but this variety has not the yielding capacity of the later varieties and does not recover well after grazing.

Varieties for Early Grazing Followed by Hay or Grain Crop.

Algerian (for the tablelands and higher portions of the slopes districts) and Belar (for the main wheat areas) are both excellent varieties for this purpose.

Distinction of Varieties on Grain Sample.

Farmers and depot-keepers may have to distinguish between these varieties on samples. The following brief descriptions will enable this to be done:—

Where both grains of each spikelet carry a weak awn, the variety is *Algerian.* The grain is brown, rather long and pointed, and numerous basal hairs can be seen around a definite basal scar at the base of the primary grain.

Belar also has a brown grain, but it can readily be distinguished by the strong awn only on the primary grain, and there are no basal hairs around the basal scar.

Fulghum has a brown grain with, often, dun mottlings on the brown background. It has only a weak to intermediate awn on the primary grain which is sometimes missing.

Mulga has a creamy-white to light-brown grain, with a strong awn only on the primary grain. •

THE GROWING OF CELERY.

A Ready Demand Exists for a Quality Product.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

Celery Blanched with Boards, Anna Bay.

CELERY has been brought into prominence on the Sydney markets by long, white celery grown in South Australia, and which still dominates the market from April to September. In recent years a few growers in Sydney, Wellington, Moss Vale, Anna Bay and the Murrumbidgee Irrigation Area have commenced to produce celery which compares favourably with the South Australian product, and there is now ample evidence that fresh, green celery of good appearance and high quality can be grown in New South Wales. The well-blanched, long-stemmed product marketed by some local growers meets a ready demand in the Sydney market and new growers who have suitable soil and are prepared to study the technique of production should meet with success.

Factors essential to success in celery growing are suitable climate and soil, and abundant water supply; many parts of New South Wales have these three essentials.

South Australian growers generally are most efficient; they realise that celery demands very exacting conditions and care, and their crops do not want for attention in any detail. The leading growers for many years have selected seed plants from the best of their crops and so have evolved fixed varieties eminently suitable to their own conditions.

Soil and Water Supply.

For celery the soil must be well drained, yet have a good water-holding capacity; it must be abundantly supplied with plant food materials and rich in organic matter. Where the soil is not naturally well supplied with organic matter exceptionally large quantities of animal manure, or green manure crops, should be worked into it before growing celery. Also, soils that are inclined to be acid should be limed, preferably with dolomite lime, at the rate of 2 tons per acre.

Practically the whole of the celery produced in the United States is grown on reclaimed swamps, the soil nearly always being pure peat. In South Australia the soil varies in character, excellent celery being grown on alluvial loams and other soils containing abundance of organic matter.

It is impossible to grow celery without a reliable water supply, for the crop must be heavily supplied with water to produce heavy yields and high quality.

Climate.

Although this crop is classed as a cool climate plant, good results can be obtained in warm districts—the only portion of New South Wales which is not suitable to commercial celery growing being the far North Coast district.

Best climatic conditions are to be found in a cool district, with cool nights and warm days. A district with a low rainfall is preferable, as this feature greatly reduces loss from disease.

Celery is subject to both frost injury and sun scald, but if correctly grown it will withstand both to a marked degree.

Time of Sowing.

On the coast seeding can be carried out during August, and during the period November to February. Many growers have found August the most satisfactory time to sow seed, as the crop can be forced along and harvested early in the new year before the South Australian crop is on the market. This early crop can be grown in four and a half months in reclaimed swamp soils in the Sydney and Anna Bay areas and elsewhere along the coast.

Correctly Grown Celery Seedling Ready for Transplanting.
Note sturdiness and also the bunches of fibrous roots, the result of tap-root trimming.

Raising the Seedlings.

Celery seed is extremely small and difficult to germinate, and every care must be exercised in raising the seedlings. Newly germinated seedlings are extremely small and tender; they make very little growth during the first four weeks, and require constant care to protect them from frost injury and sun scald.

For the seed-bed, an open textured soil should be turned over, working in a small amount of superphosphate and heavy dressings of decayed organic matter. This should be done several weeks before the seed is sown. Thoroughly water the beds, then cultivate with a forked hoe. Regularly water and cultivate to improve soil texture and germinate and destroy weeds. Finally reduce the seed-bed to a fine surface by raking. Seed-beds must be firmed to prevent drying out near the surface.

Seed should be sown in shallow furrows spaced 6 inches apart. These furrows are ¼ inch deep, and may be made by pressing the edge of a board into the soil. Flop the board over on its other edge for the next furrow; if the board is 6 inches wide the furrows will be spaced correctly. The seed is sown thinly, then covered by dragging the edge of the planting board across the bed. The soil is then firmed over the furrows by pressing with the flat of the board.

Water the bed thoroughly with a fine spray, and then mulch with rotted manure. Water each morning if the weather be fine to assure a supply of moisture in the surface soil. At no time should the surface soil be allowed to become dry.

Germination will take place in one week during warm weather and in up to three and a half weeks in cool weather. Some growers erect light hessian covers over the beds in hot weather to protect the plants from sun scald. It is much better practice, however, to irrigate regularly, even twice daily, and grow hardy seedlings in the sun, than to risk soft, cover-grown seedlings, which may be destroyed by hot weather when they are transplanted.

If germination is good and a thick stand of seedlings occurs, the plants should be thinned out. Some growers prick out the seedlings into other beds in order to obtain sturdy plants for transplanting.

Root Trimming.

This operation is carried out when the seedlings are about 2 or 3 inches in height. It results in the formation of strong fibrous feeding roots.

A sharp-edged tool is forced under the rows of plants at a depth of 2 inches, thus severing the tap root. There are several tools suitable for this job; one is a narrow, flat-faced spade which has a fine, keen edge. A good tool is a long-bladed knife, which can be run along the rows at an angle, thus severing the tap.

If the seedlings are to be pricked out before being transplanted to the field, the taps can be severed when the plants are lifted for pricking out. It is most important to water the plants heavily immediately after root trimming to prevent excessive wilting and to allow the plants to form fresh feeding roots quickly.

Field Preparation.

The celery field must have a deep and early preparation, including the incorporation into the soil of as much organic matter as possible. Poultry manure is ideal for this crop in heavy soils, although equal parts of poultry and cow manure are more suitable for open-textured soils. The first ploughing should be as deep as practicable for the type of soil used. Thereafter cultivate to destroy weeds, and replough to a depth of 6 inches a short time before transplanting. Use the cultivator freely, and have the soil in the best possible condition.

Transplanting.

Seedlings are ready to set out when they are from 4 to 6 inches high. They should have a sturdy root and stem growth and should be dug from the bed so that as much root and soil as possible are lifted with them.

The seedlings should be set out in rows spaced 3 feet apart, the plants being spaced 6 to 8 inches apart in the rows. After striking out the drills, 10 cwt. of a mixture consisting of two parts superphosphate and one part of sulphate of ammonia or 10 to 15 cwt. of a complete fertilizer per acre should be incorporated into the soil along the drills. It is advisable to run irrigation water down the drill before setting out the plants. Usually the seedlings are set into the damp soil not deeper than 2 to 3 inches below the original soil level. The objection to deep planting lies in the danger of the plants being destroyed by disease, which attacks the stem and heart when covered with soil. It is a mistake to trench celery in this country.

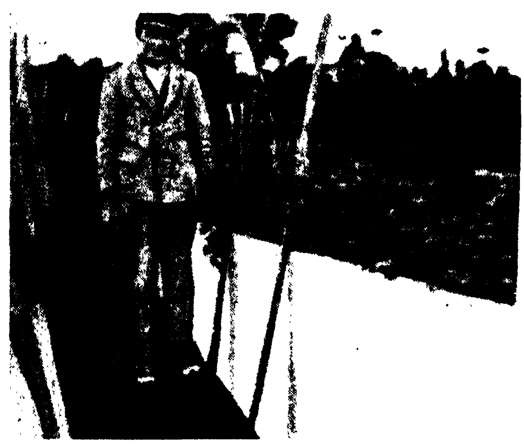
The bed method of planting celery, in which rows are about one foot apart, is only to be considered if the grower is content to grow small mature plants, since this method restricts plant development. The South Australians set out two rows one foot apart, then a space of three feet between the next set of two rows. Water is applied down between the two close rows—the wide rows being left for cultivation purposes only. The objection to this method of planting is poor air ventilation between the rows, encouraging the development of fungous and bacterial diseases. However, the amount of blanching material is reduced by half, as only the outside of the double rows require to be blanched.

Good Crop Management is Essential.

The management of the celery crop in the field is most important; upon it depends the success of the venture. Celery should be forced along at all times. Lack of uniform growing conditions may cause serious defects such as hollow stem, pithiness, premature seed-head formation, loss of quality, excessive fibre and coarseness.

Irrigation Practice.

Celery is extremely shallow rooting, and at no time should the soil be allowed to dry out, even temporarily. Provided the ground is well drained it is almost impossible to over-water in fine weather, but disease is encouraged if the surface soil becomes saturated over a long period. The crop should be cultivated as soon as the ground is dry enough after irrigating.



Blanching Celery. Note the Length of the Plants.

In the early stages of growth the plants may be watered thrice weekly, provided the weather is fine. In the latter stages of growth it is essential to water twice a week. Furrow irrigation is much more effective than overhead watering as the top growth is kept dry.

South Australian growers water down between the two close rows. This method may be quite all right in a dry climate, but in other areas it may result in increase in disease due to the irrigation furrow remaining wet for considerable periods.

The best practice is to have single rows 3 feet apart with a water furrow running along each row. The furrow should be close to the plants in the early stages of growth, and as the plants develop the furrow should be re-made until it is out in the middle of the land between the rows of plants. This method not only encourages the roots to spread, but it also facilitates cultivation. Single-row planting and the furrow method of watering enable fertiliser to be spread and worked into the soil effectively.

Crop Nutrition.

Poultry manure is ideal for celery in heavy soils; for more open textured soil, a mixture of equal parts of poultry manure and cow manure is more suitable. As much as 100 tons per acre of animal manure may be worked into the soil during the preparation and growing period, and just before transplanting into the field the soil should be given a dressing of 10 cwt. per acre of a mixture of two parts superphosphate and one part sulphate of ammonia. If poultry manure has been used liberally in the preparation of the soil, 8 cwt. of superphosphate should be applied and the sulphate of ammonia omitted. Where animal manure is scarce, 10 to 15 cwt. of a complete fertiliser containing 5 per cent. nitrogen, 10 per cent. phosphoric acid and 5 per cent. potash is suggested.

Side Dressings are Essential.

Side dressings of liquid manure or of a mixture of superphosphate two parts and sulphate of ammonia one part should be given at regular intervals during the early stages so as to force the growth of the plants. Later, when the plants have been about two months in the field, they can be dressed with poultry manure, sulphate of ammonia or nitrate of soda, and this dressing repeated if necessary. The amount and frequency of side dressings depend entirely upon the growth and progress of the crop. It is important to keep nitrogen up to the plants, particularly in the last stages of growth.

Cultivation.

Cultivate to destroy weeds and to keep the surface soil loose and friable. When the plants are young cultivation may be deep, but as the plants grow it must become progressively shallower to avoid injuring the roots.

Blanching the Crop.

When the crop has the appearance of being three weeks off maturity it should be put through the finishing-off stage—blanching—and finally forced for the production of high quality, long, centre stems. Blanching is done by excluding the light from the plants, thus preventing the formation of chlorophyll (the green colouring matter) in the plant cells.

Strips of sisalkraft or boards may be used for the blanching process. The method of placing the boards in position is to lay them flat on either side of plant rows, force the inside edge against the plants, and then raise to a vertical position, bringing up all outside leaves and trash. The board should be placed in the soil at least 1 inch deep. The boards should be at least 10 inches wide —pieces of scrap board may be nailed together with laths to make boards that are wide enough. The boards, which are then parallel, with the celery in between, are kept in position by means of a wire clip or short stake. Sisalkraft is used extensively for blanching, and it has proved quite satisfactory. The paper is kept in position by wire hoops. Sheets of galvanised iron have been tried but have proved too heating in this State, causing scalding and pithiness as well as encouraging fungous and bacterial diseases.

The next procedure is to apply a heavy dressing of either poultry manure, nitrate of soda, or sulphate of ammonia, to the soil between rows; heavy waterings follow at three-days intervals.

The nitrogen and the water force the undeveloped heart leaves and stems and the boards, which exclude the light, produce the blanched effect on the new growth.

Celery need not be blanched; actually a large amount of the celery reaching Sydney market is not blanched. Green celery has a much stronger flavour than the blanched stalks.

The English method of blanching celery is to throw up furrows along the rows of plants. Many English growers plant out the celery in trenches, then throw up the soil to force extra length in the stems. The hilling starts when the plants are comparatively young and is continued at all stages. American celery growers in the muck lands of Ohio and New York States throw up furrows of soil in the last stages of the growth of the plant.

The celery growers of South Australia, the Japanese growers of Oregon, U.S.A., and the Californian growers, however, blanch their celery by means of strips of timber, tarred paper, or sheets of galvanised iron placed on each side of the maturing celery plants.

Success in celery culture does not lie in the blanching of the stalks, but in the growing of well-developed heads of high quality.

If one acre of celery is being grown it is not necessary to have boards or sisalkraft sufficient to blanch an acre at a time. It is only necessary to have two lots of boards or sisalkraft, and to move one lot each week from the blanched marketable plants to a fresh green lot.

Harvesting.

The inexperienced grower may have difficulty in ascertaining the mature stage of celery. The best thing to do is to cut the crop when it is large enough and when the market price is satisfactory.

The method of harvesting consists of releasing the boards, and then, with a long knife cutting off the plants below the crown, leaving the roots in the ground.

All outer leaves that are yellow, too short, coarse, thin in diameter and generally of coarse, inferior quality should be stripped off. Usually more than half the leaves are stripped off, leaving only the high quality, centre heart stalks. The base or butt of the plant is then trimmed with a knife.

Marketing.

South Australian celery is marketed in large cases, some of which are hessian or cheesecloth lined. The space between the slats gives some ventilation, but quite insufficient for this vegetable, which often comes over from Adelaide unchilled.

The Americans grow a short-stemmed celery which has a very compact heart. This celery is stood up in crates with the butts down. The slats give plenty of ventilation to the plants, which are not compacted and compressed as is the case when the stalks are packed flat.

Disease and Insect Control.

Celery seed should be treated in hot water before sowing. Tie the seed loosely, ¼ lb. at a time, in cheesecloth bags and suspend in a large volume of water (a kerosene-tin full) previously heated to 125 deg. Fahr. (57 deg. C.). Use a small lamp to maintain the temperature or insulate the tin in a box of straw. Treat for 10 minutes. After treatment, spread out the seed to dry in the shade. Do not treat weak seed, and if in doubt, make a trial first with a small quantity of seed.

A Selected Seed Plant of Export White Celery.

Celery is at all times subject to attack by aphids; these insects are controlled by spraying with nicotine sulphate, which should be added to Bordeaux spray at the rate of 12 fluid ounces to 40 gallons of spray.

There are many diseases of celery, chief of which is Chocolate Leaf Spot. The method of disease prevention is to give the plants plenty of air space when planting, thorough cultivation at all times and regular

spraying with Bordeaux mixture or dusting with copper carbonate.

Seed Selection.

Having grown a satisfactory crop, it is most important to select plants for the production of seed for the following year. Only the most desirable plants should be selected. By this means there will be a gradual improvement in the quality of the crop.

The chief points to consider in selecting plants are:—

1. Size of plants (the Sydney market demand is for large stalks).

2. Compactness of centre and heart leaves and stems.

3. Colour of stems—they must be free of blemishes.

4. Quality—usually judged by solidity of stalk, texture and absence of fibre, etc.

5. Freedom from disease.

Varieties.

Export White or South Australian White.—This is the long, Adelaide type. It is a non-hearting variety, with exceptionally long, clean stems which blanch to a fine golden cream colour. Its best feature is outstanding disease resistance.

Golden Self Blanching.—An American heart celery from eastern U.S.A., where it is grown without blanching boards. The heavy outer leaves give enough protection with slight soil hilling to give perfect blanching. This celery is of outstanding quality, but it is rather subject to Chocolate Leaf Spot.

Golden Plume.—Very similar to Golden Self Blanching; is reputed to be of French origin. This variety is of equal quality to the lastmentioned variety and is much shorter in stem.

Utah.—A green-stemmed celery of outoutstanding disease resistance which should do well in this country. The stems are fibrous, medium in length, and have a strong, characteristic flavour.

Approved Vegetable Seed—January, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed for January.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Newcastle (P. G. Legoe)	February 19, 20, 21, 22
Queanbeyan (D. Vest)	February 21, 22
Walcha (T. C. Bath)	February 25, 26
Dorrigo (W. Tomlinson)	February 27, 28
Tumut	March 4, 5
Jingellic (A. G. McVean)	March 5
Gulgong	March 12
Blayney (K. Gresser)	March 18, 19
Warialda (L. Rolfe)	March 18, 19
Camden (G. F. Sidman)	March 20, 21, 22
Sydney R.A.S. (G. C. Somerville)	Mar. 29 to Ap. 9
Bellingen (C. P. Franey)	April 22, 23
Grafton (C. W. Creighton)	April 24, 25, 26
Walbundrie (C. Leischke)	October 1

TEMPORARY PASTURES IN THE WHEAT ROTATION

A Means of Increasing Animal Products.

J. N. WHITTET, H.D.A., Chief Agrostologist.

THE demand for increased quantities of animal products of all descriptions means that greater calls will be made on pasture and crop areas, and consequently, in addition to conducting good pasture management practices, an endeavour must be made to establish additional areas of sown pastures and grazing lucerne.

One major difficulty to contend with in this work is the fact that superphosphate—an essential in pasture establishment operations—is still not freely available in large quantities for use in inland farming and grazing areas. Details of the amounts of fertilizer that may be purchased are obtainable from fertilizer agents. The only alternative to sowing pastures and lucerne the most effective way, that is on well-worked fallows with 1 cwt. superphosphate per acre, will be to plant such species as Wimmera Rye, lucerne, and some of the clovers on at least a proportion of the wheat area to be sown next autumn, as under these conditions the grass and clover seedlings will have access to some fertilizer.

The seeding rate for wheat under these conditions should not exceed 45 lb. per acre (on soils which produce a rank growth use only 30 lb. per acre) in order to give the pasture plants a chance to become established and not be unduly crowded by the rapid growing cereal.

Should the spring be dry, the young pasture plants are likely to suffer, because the more robust rooting systems of the cereal plants will unfavourably compete with those of the pasture plants for soil moisture.

Where pasture seeding with a cereal is to be carried out, wheat is preferred to oats, as the latter crop crowds the pasture seedlings more than wheat plants.

The recommendations of pasture mixtures for the various wheat zones—as shown in the map which accompanies this article—are as follows:—

Pasture Recommendations.

Wheat Zone No. 1.

Sow a mixture of Italian Rye 10 lb. and Red clover 4 lb. seed per acre; on heavy basaltic flats, add 2 lb. Black Medic (*Medicago lupulina*) seed to the mixture.

Wheat Zone No. 5.

Sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb., Ball clover 1 lb., Barrel clover 1 lb., and Burr trefoil 1 lb. per acre on soils of good depth; where soils are shallow, omit the lucerne from the mixture and increase the Wimmera Rye to 3 lb. and the Ball and Barrel clovers and Burr trefoil to 2 lb. of each per acre.

Wheat Zone No. 13.

In the higher rainfall sections of this area Italian Rye 10 lb. and Red clover 4 lb. is a satisfactory mixture for a short term pasture of two years. Where a hardier mixture is required, plant Wimmera Rye 2 lb., Subterranean clover (mid-season strain) 3 lb., Ball clover 2 lb. per acre; on deep, well-drained soils add 1 lb. of lucerne seed to this mixture.

Wheat Zones Nos. 2, 3, 4, 6, 9, 10, 11, *and* 12.

Where soils are friable and deep use a mixture of Wimmera Rye 1 lb., lucerne 2 lb. and Burr trefoil 2 lb. per acre; on the heavier types of country, unsuitable for lucerne, sow Wimmera Rye 3 lb. and Burr trefoil 4 lb. per acre. The lower rainfall sections of Zone No. 12 are too dry for lucerne and there the Wimmera Rye-Burr trefoil mixture should be planted.

Wheat Zones Nos. 7 and 14.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb. where soils are of good depth; on shallower country, use Wimmera Rye 3 lb. and Subterranean clover (mid-season strain) 3 lb. per acre.

Wheat Zones Nos. 8, 17 and 18.

In Zones Nos. 8 and 17 and the good rainfall sections of Zone No. 18, sow similar mixtures to those given for Zone No. 6; use Subterranean clover (early strain) 1 lb., and Barrel clover 1 lb., instead of Subterranean clover (mid-season strain), in the lower rainfall parts of Zones Nos. 17 and 18.

Wheat Zones Nos. 15, 19 *and the Eastern half of Zone No.* 20.

Use Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (early strain) 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. per acre on deep soils. In the case of shallow soils omit the lucerne and increase the Ball and Barrel clover seedings to 2 lb. each.

Wheat Zone No. 16 *and the Western half of Zone No.* 20.

Plant Wimmera Rye 1 lb., lucerne 2 lb., Ball clover 1 lb., Barrel clover 1 lb., Burr trefoil 1 lb. per acre on deep soils; for soils of poor depth use a mixture per acre of Wimmera Rye 3 lb., Ball and Barrel clovers and Burr trefoil 2 lb. of each. The lower rainfall sections of Zone No. 20 are too dry for lucerne.

Wheat Zones Nos. 21 *and* 22.

In these Zones sow Wimmera Rye 3 lb., and Burr trefoil 3 lb. per acre.


MAP
OF
NEW SOUTH WALES
SOUTH PACIFIC OCEAN
TASMAN SEA
QUEENSLAND
STATE OF SOUTH AUSTRALIA
STATE OF VICTORIA

Irrigated Areas. (A superphosphate ration is available for establishing pastures under irrigation.)

The most satisfactory method of establishing pastures on irrigated country is to sow the grass and clover seeds mixture on a correctly graded and well prepared seed bed, and not with a crop of wheat.

Suitable temporary pasture mixtures for irrigated country would be:—

A. Where the amount of water is limited in quantity:—Wimmera Rye 2 lb., lucerne 2 lb., and Subterranean clover (mid-season strain) 2 lb. per acre.

B. In areas where the water supplies are plentiful:—Italian Rye 2 lb., Wimmera Rye 2 lb., Perennial Rye 4 lb., Red clover 2 lb., Subterranean clover (mid-season strain) 2 lb., lucerne 2 lb. per acre. On shallow soils having impervious subsoils close to the surface, omit lucerne from the mixture.

General Notes.

Owing to the large amount of "hard" seed in Ball and Burr clovers, only scarified seed of these species should be planted.

One of the disadvantages of sowing lucerne with wheat, is that if the spring and early summer months turn in very dry, this legume is unlikely to become established satisfactorily when sown with a cover crop.

In heavier rainfall districts and under irrigation, other grasses and clovers such as *Phalaris tuberosa*, Perennial Rye, White clover, are suitable for the establishment of permanent pastures; these species, however, are too valuable to include in the wheat rotation as they would be approaching their maximum carrying capacity when wheat was to be planted again.

Any farmer requiring details of suitable permanent pasture mixtures for his country should write to this Department for recommendations

Further details covering pasture improvement operations will be found in the following publications which can be obtained, free of cost, from the Department of Agriculture, Sydney:—

Pasture Improvement in Northern Tableland Districts.

Pasture Improvement in Central and Southern Tableland Districts.

Pasture Improvement in the Slopes, Plains and Western Division

Lucerne as Pasture in Western Districts.

Methods of Establishing Improved Pastures.

Methods and Machinery for Top-dressing Pastures.

Pasture Management.

Pasture Improvement on the Murrumbidgee Irrigation Area.

Biological Control of St. John's Wort.

Spectacular Work by Insects.

AGRICULTURAL science has many weapons in its armoury, and there are more ways of killing a weed than by hoeing it out or poisoning it. St. John's Wort is still another farm pest which is being attacked successfully through the agency of another form of life.

Mr. A. Pearson, Weeds Officer, recently visited St. John's Wort areas in Victoria and New South Wales in company with officers of the Council for Scientific and Industrial Research, wort areas in the Ovens and Kiewa Valley districts in Victoria being investigated with particular regard to biological control methods. The C.S.I.R. have released three different insects since 1934 in the Ovens Valley in an endeavour to control the spread of St. John's Wort. These insects comprise a root borer known as *Agrillus hyperici*, and two leaf-eating beetles, known as *Chrysolina hyperici*, and *Chrysolina gemellata*.

The control that has been effected by these insects, particularly the two last-named beetles, is most spectacular. The beetles are now spread over a distance of approximately 40 miles of the Ovens Valley and have freed numerous substantial areas of St. John's Wort. There appears to be little doubt that this weed will be destroyed in Victoria by these beetles.

Beetles were collected for liberation in New South Wales, and liberations were made at Tumbarumba, Mudgee, and Nulla Mountain, near Rylstone. Liberations of these beetles have been made previously at these centres. At Tumbarumba a liberation made in December, 1944, has developed satisfactorily and there appears to be every reason to hope that they will carry out the same spectacular work in that district as in Victoria. Prospects are not quite so bright in the Mudgee district, but the liberation of the beetles made in 1942 has persisted and the insect may adapt itself to the hotter, drier conditions of the Mudgee area. The root boring insect, *Agrillus hyperici*, is established at Mudgee and is definitely killing out some of the wort. Its work is, however, very slow, and it appears that if it is to succeed in bringing about control a very long period of years may have to elapse.

Seed Wheat, Oats and Barley for 1947 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat, oats and barley who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Apollo.—

Coddington, C. E. & A. R., Moulton Farm, Harden.
Kendall Est., B. W. J., Lulworth, Murrumburrah.

Baldmin.—

Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Trengrove, C. D., "Hillview," Koorawatha.
Watson Est. E. W., South Greenbank, Thuddungra, Young.

Baringa.—

Capps, A. E., & Sons, Wynfield, Cowra.
Amos, A. J., "Rockdale," Cowra.

Bencubbin.—

Stewart, J. M., "Bygoo," Ardlethan.
Stewart, J. L., "Meroola," Ardlethan.
Hawthorne, J. W., "Uley," Ardlethan.
Elder, J. L., "Rockhall Mains," Kamarah.
Carroll, F. J., "Killara," Ardlethan.
Richens, T. E., "Warrawee," Ardlethan.
Turnbull, J., & Son, "Sherwood Park," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Hawthorne, F. A., "Uley," Ardlethan.
Ballantyne, G. G., "Clifton," Ariah Park.
Renshaw, C., "Boogadah," Binnaway.
Heath, H. H., "Eugildry," Leadville.
Rowbotham Bros., Box Valley, Dunedoo.
Sullivan, T. P., Dunedoo.
Hookway, S., "La Questa," Leadville.
Deutcher, Les., Eden, Birriwa.
Ewin, C., "Fenella," Birriwa.
Granger, F. H., Black Hill, Birriwa.
Cummins, Est. P., Broula, Cowra.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Ward, G., "Girrawheen," Grenfell.
Keir, J. A., "Braeside," Grenfell.
Wood, K., "Boongalla," Rocky Glen, via Coonabarabran.
McEvoy, J., "Levuka," Gugaldie.
Howe, K., Bungowannah.
Ross, R. D., Brocklesby.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Hutson, F. O., Walbundrie.
Adams, A. H., Farm 161, Stoney Point, via Leeton.
Amos, A. J., "Rockdale," Cowra.
Ashworth, E. J., Landawne, Bathurst Road.
Arnold, R., Farm 19, Corbie Hill Road, Leeton.
Baker, M., Temora.
Bradford, R. & V., Cooringee, Nubba, via Wallendbeen.
Blythe, D., North Groongal, Carrathool.
Bowditch, C., Farm 1390, Hanwood.
Boxsell, L. B., "Cherry Wood," Cullinga Mines, via Wallendbeen.
Carey, J. & Sons, Numalla, via Trundle.
Cuthbert, H. H., Grong Grong.
Cooper, S. J., Rock Dale, Barmedman.
Davy's Plains Pty. Ltd., Cudal.
Davidson, D., Calitris, Young.
Denyer, A. N., Mimosa Road, Temora.
Davis, O. P., "The Pines," Gumble.
Dickie, Mrs. A., Box 106, VV, Griffith.
Davison, N. R., Werrington, Cunningar.
Edwards, J., Eglington.
Elliott, H. O., "Fairfield," New Grenfell Road, Forbes.
Forsythe, J. G., "Gwandolan," Cootamundra.
Hart, J. K., Lagoona, Galong.
Herbert, T. J., "Carnarvon," Road Mail Box 519, Leeton.
Johnson, R. R., "Umarla," Forbes Road, Grenfell.
Jones, E. G., "Renee Vale," West Wyalong.
Killick, K. P., Illawa, Galong.
Kelly, W. G., "The Oaks," Barmedman.
Kendall Est., B. W. J., Lulworth, Murrumburrah.
Love, R. B., "Yarrabundle," Trundle.
Marchington, S., Box 618 KK, Griffith.
McDowell, E. J., Purlewaugh, Ulamambri.
Mullens Bros., Goragilla, Binnaway.
Michalk, G. B., "Westwood," Eugowra Road, Parkes.
Mailer, R. V., Trundle Park, Bogan Gate Road, Trundle.
Noakes Bros., "Rose Farm," R.M.B., 46, Thuddungra.
O'Neill, W. A., "Yarra," Cowra.
O'Neill & Bowlding, "Frogmore," Est., Frogmore.
Phillips, A., "Ratho," Young.
Pfitzner, A., Stack Pool, Goolgowi.
Rowlands, K., "Wilverlyn," New Grenfell Road, Forbes.
Rowlands, E. J., "Green Hills," New Grenfell road, Forbes.
Reynolds, S. R. & Bellamy, "Burrawong," Cumnock.
Stephens, E. F., Farm 1079, Murrami.
Scott, W. J., Lansdowne, Bathurst Road.
Scott, Est. J., Hillview, Cootamundra.
Trotman, R. E., "Norton," New Grenfell road, Forbes.
Tremain, W., Obley-road, Yeoval.
Thompson, J. & Patton, T., "Baroona," West Wyalong.

Bencubbin—continued.
Watts, E. J. & Sons, Private Bag, Euraley, via Narrandera.
Wells, W., Goolgowi.
Windus, L. R., Cudal.
Watts, W. C., Gumble, via Manildra.
Wallace Bros., "Dungavan," Temora.
Young, J., "Southern Wood," Cumnock.
Young, C. R., "Hillcrest," Ulamambri.

Bobin.—
Reid, G., Moorwartha.

Bordan.—
Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
Payten, J., "Kaloola," Goolagong.
Barber, A. E., "Embrose," Baldry.
Balcombe, H. J., "Pekoona," Toogong.
Cullen Bros., Harden.
Davis, O. P., "The Pines," Gumble.
Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
Killick, K. P., "Illawa," Galong.
Kelly, W. G., "The Oaks," Barmedman.
Lodge, C. E., "Ellerslie," New Grenfell road, Forbes.
Love, R. B., "Yarrabundle," Trundle.
McLaren, R. W., "Glenmore," Barmedman.
Malcolm, A. D., Farm 1039, Colando, via Leeton.
McCormack, A., Farm 159, Stoney Point, via Leeton.
Quodling, W. J., "Garangery," Corbie Hill road, via Leeton.
Russell, L. J., Morongla.
Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
Scott, Est. J., "Hillview," Cootamundra.
Thackeray, R. H., "Woornack," Young.
Watts, E. R., Bald Hills, Manildra.

Celebration.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Charter.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
Thackeray, R. H., "Woornack," Young.

Dundee.—
Aitken, W. H., "Afton," Beckom.
Carroll, F. J., "Killara," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Black, R. B., "Braemar," Greenthorpe.
Howe, K., Bungowannah.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Humphries, K., Bungowannah.
Barrett, G. & C., Woodridge, Manildra.
Langfield, R., Morongla.
Quinn, W. A., "Inglewood," Young.
Wallace Bros., Dungavan, Temora.

Eureka.—
Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
Cartwright, F. C., "Boundary Villa," Sebastopol.
Renshaw, C., "Boogadah," Binnaway.

Eureka—continued.
Stapleton, H., "Gundamain," Cudal.
Wallace Bros., Dungavan, Temora.

Eureka 2.—
Ballantyne, G. G., "Clifton," Ariah Park.

Echo.—
Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Fedweb.—
Hodges, C. H. & Sons, Baldry.

Ford.—
Stewart, J. L., "Meroola," Ardlethan.
Carroll, F. J., "Killara," Ardlethan.
Black, R. B., "Braemar," Greenthorpe.
Capps, E. A., & Sons, Wynfield, Cowra.
Walker, F. W., "Glenelg," Canowindra.
Keir, J. A., "Braeside," Grenfell.
Ross, C. E., Brocklesby.
Frohling, W., Moorwartha.
Hutson, F. O., Walbundrie.
Balcombe, H. J., "Pekoona," Toogong.
Balcombe, R. A. H., "Sussex," Toogong.
Bendle, W. J., "Bankside," Monteagle.
Coddington, H. G., "Invergowrie," Young.
Davis, O. P., "The Pines," Gumble.
Gray, F. A., "Sterling Chase," Cudal.
Garry, J., "Burramunda," Grenfell-road, Young.
Glenn, A., Farm 1428, Murrami.
Hart, J. K., Lagoona, Galong.
Hall Bros., "Ellerslie," Wallendbeen.
Hodges, C. H., Baldry.
Johnson, T., Farm 348, Wamoon.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
King, F. R., Farm 388, Wamoon.
Killick, K. P., Illawa, Galong.
Langfield, R., Morongla.
Martens, C. F., "Quamby," Grenfell-road, Young.
Murray, R. S., "Maryville," Cudal.
Marchington, S., Box 618KK, Griffith.
Rickets, C. T., "Peak View," Young.
Stapleton, H., "Gundamain," Cudal.
Scott, Est. J., Hillview, Cootamundra.
Salmon, M. T., Pucawan.
Tremain, W., Obley-street, Yeoval.
Thackeray, R. H., "Woornack," Young.
Thornberry, L. C., "Waverty," Private Bag, Cudal.
Watson, Est. E. U., South Greenbank, Thuddungra, via Young.

Gabo.—
McColl & Sons, H. O., "Strathmore," Koorawatha.
Black, R. B., "Braemar," Greenthorpe.
Boxsell, L. B., "Cherry Wood," Cullinga Mines, via Wallendbeen.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
Kendall, Est. B. W. J., Lulworth, Murrumburrah.
McClintock, M., Mannamite, Cootamundra.
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
Rickets, C. T., Peak View, Young.

Gabo—continued.
Roberts, N., "Hillside," Cootamundra.
Scott, Est. J., "Hillview," Cootamundra.

Ghurka.—
Stewart, J. M., "Bygoo," Ardlethan.
Baker, M., Temora.
Wallace Bros., Dungavan, Temora.

Gular.—
Stewart, J. M., "Bygoo," Ardlethan.
Hutson, F. O., Walbundrie.

Javelen.—
McLaren, R. W., "Glenmore," Barmedman.

Koala.—
Cummins, Est. P., Broula, Cowra.
Payten, J., "Kaloola," Goolagong.
McEvoy, J., "Levuka," Bugaldie.
Cassells, W. T., "Omagh," Frogmore.
Carey, J. & Sons, Numalla, via Trundle.
Forsythe, J. G., Gwandolan, Cootamundra.
Hall Bros., "Ellerslie," Wallendbeen.
Hodges, C. H. & Sons, Baldry.
Hurle, A. M., Grogan.
Killick, K. P., "Illawa," Galong.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
McClintock, M., Mannamite, Cootamundra.
Russell, L. J., Morongla.
Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
Scott, Est. J., Hillview, Cootamundra.
Trotman, R. E., "Norton," New Grenfell road, Forbes.

Kendee.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Kondut.—
McLaren, R. W., "Glenmore," Barmedman.

Nabawa.—
Watts, E. J. & Son, Euroley, via Narrandera.

Pusa 4.—
Stewart, J. L., "Meroola," Ardlethan.
Aitken, W. H., "Afton," Beckom.

Ranee.—
Salmon, M. T., Pucawan.

Rapier.—
Aitken, W. H., "Afton," Beckom.
Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Amos, A. J., "Rockdale," Cowra.
Coddington, J. T., "Homeleigh," Cunningar.
Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
Hodges, C. H. & Sons, Baldry.
Jones, E. G., "Renee Valley," West Wyalong.

Rapier—continued.
Langfield, R., Morongla.
Murray, R. S., Maryville, Cudal.

Totadgin.—
Aitken, W. H., "Afton," Beckom.

Turvey.—
Reid, G., Moorwartha.
Frohling, W., Moorwartha.

Ula.—
Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Waratah.—
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.
Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
Bourke, P., Harden.
Corcoran, J. R., "Ballyryan," Boorowa.
Forsythe, J. G., Gwandolan, Cootamundra.
Garry, J., Burramunda, Grenfell-road, Young.
Killick, K. P., Illawa, Galong.
McCarthy Bros., East Grove, McMahon's Reef, Galong.
Salmon, M. T., Pucawan.
Thackeray, R. H., "Woornack," Young.
Ward, R., Gilgal, Frampton.

Yalta.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Oats.

The Commonwealth Prices Commissioner has fixed the ceiling price at 5s. 6d. per bushel, F.O.R. grower's rail siding, for approved graded seed oats as listed in the "Agricultural Gazette."

Algerian.—
Capps, E. A., & Sons, Wynfield, Cowra.
Howard, G., Springdale.
McClintock, M., Mannamite, Cootamundra.

Belar.—
Black, R. B., "Braemar," Greenthorpe.
Hockings, J., Bumbaldry, via Cowra.
Batkin, E. A., Greenthorpe.
Humphries, K., Bungowannah.
Campbell, A., "Billabulla," Young.
Hall Bros., "Ellerslie," Wallendbeen.
Quinn, W. A., Inglewood, Young.
Salmon, M. T., Pucawan.
Wallace Bros., Dungavan, Temora.

Burke.—
Marshall, A. O. & B. C., "Pinelodge," Canowindra.

Fulghum.—
Crick, T. F., Binginbar, Gollan.

Barley.

Prior.—
Wallace Bros., Dungavan, Temora.

Plant Diseases.

RAINFALL IN RELATION TO—
THE PRODUCTION OF BEAN SEED
Free of the Bacterial Blight Diseases.

R. D. WILSON, M.Sc., M.Sc.Agr., Plant Pathologist.

IN this article the author discusses the problem of production of bean seed free of seed-borne diseases, comparing the raising of crops in areas of very low summer rainfall —as used with success in the United States of America—with the growing of crops in higher rainfall areas under a certification scheme having a zero tolerance for the major bean diseases.

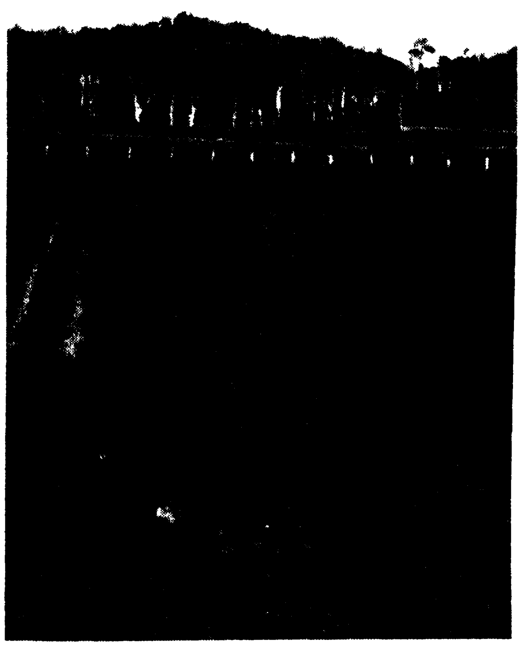
The most important seed-borne diseases of French beans are various bacterial diseases known collectively as "bacterial blight"; anthracnose, which is a fungous disease; and mosaic, a virus disease.

Although a bacterial disease of beans was first reported in 1892 in the United States[8], it was not until 1925 that a bacterial disease was recorded in New South Wales on specimens from the Grafton district[5]. Further records were made from various localities in 1928 and 1929, and by 1931 the halo blight disease, caused by the bacterial organism *Pseudomonas medicaginis* var. *phaseolicola* Stapp and Kotte had become widespread throughout the State. It is not known whether the earliest record, made in 1925 was American common blight (*Xanthomonas phaseoli* (E.F. Sm) Dowson) or halo blight.

American common blight was definitely shown to be present in New South Wales in 1936[5]. It was not until Navy beans were grown here in commercial acreages during the war years, however, that American common blight became widespread or serious. This disease is now the major disease of Navy bean crops grown on the Northern Tablelands.

In 1936 bacterial brown spot (*Pseudomonas syringae* Van Hall) was recorded in this State on French beans[6]. The bacterial wilt organism, *Corynebacterium flaccumfaciens* (Hedges) Dowson, has been isolated from seed in Victoria[1], but has not yet been recorded in New South Wales. Isolations made by the writer in May, 1946, from beans collected at Leeton, New South Wales, yielded a pathogenic bacterial organism which, on cultural characteristics, appeared to be *Xanthomonas phaseoli* var. *fuscans* (Bark) Starr and Burk., a distinct strain of the American common blight organism.

Anthracnose (*Colletotrichum lindemuthianum* (Sacc. and Magn.) Briosi and Cav. has not been a disease of major importance



A Crop of Beans grown for Production of Certified Seed.

in this country in recent years, and at present almost all seed stocks are free of anthracnose. Mosaic is occasionally responsible for yield reductions in bean crops, especially crops planted in October and November in dry seasons, but, fortunately, the percentage of seed carry over in the case of our main bean varieties does not appear to be very high.

Attempts to Produce Disease-free Seed in the Drier Areas of New South Wales.

In 1931 it was evident that practically all our stocks of Canadian Wonder, then our main French bean variety, were severely infected with halo blight. At that time almost all of Australia's French bean seed was grown at Orbost in Victoria. Orbost has a sufficiently high rainfall to produce high yields of bean seed without irrigation. It was realised that attempts would have to be made to produce seed free of halo blight, or to introduce or develop varieties possessing resistance.

In this State the work of N. S. Shirlow at Hawkesbury Agricultural College resulted in the production of the varieties Hawkesbury Wonder and Clarendon Wonder, both of which possess very satisfactory field resistance to halo blight, although moderately susceptible to American common blight. In Victoria selections having resistance to the disease were made from Canadian Wonder, the most noteworthy of these being the Burnley Selection strain.

It was known in 1931 that, in the United States, bean seed grown in the drier western states such as Idaho and California, usually carried much less of the bacterial blight diseases and anthracnose than seed produced in States possessing a higher rainfall, such as New York and Michigan.

Commencing in the 1931-32 season, trial plantings of beans for seed were made in some of the drier areas of this State—such as Dubbo, Wellington and Bathurst. In subsequent years, bean seed was also grown in other areas including Mudgee, Gilgandra, Leeton and Hillston. Except for some crops in the tableland areas irrigation was required for these crops. The main effort in this direction was concentrated in the first place on Tweed Wonder for supplying seed to green bean growers on the Central and North Coast who grew winter and early spring crops of this variety. Attempts were also made to build up supplies of disease-free seed of Canadian Wonder and later of Brown Beauty (Premier) and Wellington Wonder.

Experience over several years in all the localities mentioned above showed that unless seed absolutely free from the bacterial blight diseases was used for the planting of seed crops or, unless an abnormally dry season was experienced, it was necessary for the grower to rogue his seed crop to prevent secondary spread.

This method of seed production, though costly, served a useful purpose in providing coastal green bean growers with seed relatively free from halo blight. It was made possible by the fact that many bean growers, particularly in the Gosford district, were prepared to pay high prices for high quality seed.

One fact of importance which has thus emerged from the years of experience in growing bean seed in areas such as Dubbo, Wellington and Leeton has been that, although the relatively dry conditions of such areas are helpful in reducing the rate of secondary spread of halo blight and American common blight, such areas, except in abnormally dry seasons, are not sufficiently dry to permit of the production of blight-free seed, unless the seed used for the seed crop is free from disease in the first place.

Experience in the United States.

According to Mackie, Snyder and Smith[4], there are bean seed-growing areas in California where the summer rainfall is sufficiently low to prevent all secondary spread of the bacterial blight diseases and anthracnose. They state that if a line of seed effected with one of these diseases is planted in these dry areas and only furrow irrigation is practised, seed free or apparently free of the disease is invariably produced. The process of growing seed in such areas, therefore, serves as a most effective seed treatment—more efficient than any heat or chemical treatment which has yet been reported.

On the results of experience in the United States, Mackie, Snyder and Smith[4] state that an average rainfall of less than 1 inch over a four months summer growing period would seem to ensure no secondary spread of the bacterial blight diseases and

anthracnose. In their opinion an average summer rainfall for the four months growing period of 1 to 3 inches represents a border-line condition, and an average summer rainfall of more than 3 inches is not conductive to the consistent production of clean seed. Table I, compiled from data in the publication of Mackie, Snyder and Smith[4] shows the average rainfall for a number of weather stations in bean seed-producing areas in eight States of the United States. The consistently low summer rainfall of certain bean growing areas in California is evidenced by the fact that the average four months summer rainfall for eleven weather stations over a period of 28 to 40 years is only 0.40 inches.

TABLE I.—Average precipitation over a four months bean seed-growing season (June to September) for established bean producing areas in eight states of the United States.*

State.	No. of Stations.	Total Rainfall in Inches during Growing Period, June to September.	
		Average for Stations.	Range.
New York	3	12·00	10·93–13·52
Michigan	3	11·40	10·26–12·76
Montana	3	6·20	5·73– 6·55
Colorado	3	5·00	3·20– 6·44
Wyoming	3	3·70	3·08– 4·45
Utah	3	3·50	3·32– 3·81
Idaho	3	2·90	1·83– 3·77
California	11	0·40	0·23– 0·64

* Data from Mackie, Snyder and Smith.

Rainfall Figures for New South Wales.

Tables II and III have been prepared from data supplied by the Weather Bureau, Sydney. With a few exceptions the average figures given are for the 30-year period 1911-40 inclusive. In computing the average rainfall over a four months summer period, the months selected have been those which, it is considered, would be most satisfactory for bean seed production (January to April) except for some tableland and coastal areas where the figures for December to March have been used). Table II shows the average rainfall over the selected four months summer period for the recording station in each of the main divisions of the State having the lowest average rainfall over the four months period. Thus, these stations have been selected for low rainfall and their inclusion does not signify that they have the irrigation water or soil suitable for bean seed production.

TABLE II.—Average annual and monthly precipitation for the 30-year period 1911–40 for the recording station in each Division of the State having the lowest rainfall over a selected four months bean seed growing period.

Division.	Weather Station.	Average Rainfall (inches).						Four Months Growing Period.
		Annual.	Dec.	Jan.	Feb.	Mar.	Apr.	
Western	Milparinka ...	6.83	0.94	0.66	0.76	0.45	0.44	2.31 *
Riverina	Booligal	11.74	1.08	0.62	0.77	0.72	0.86	2.97 *
Central-western Plains ...	Nyngan	14.92	1.95	1.44	1.15	1.13	1.04	4.76 *
South-western Slopes ...	Barmedman ...	17.80	1.83	1.55	1.34	1.38	1.37	5.64 *
North-western Plains ...	Walgett	16.63	1.96	1.85	1.41	1.42	1.12	5.80 *
Central-western Slopes	Forbes	19.26	2.12	1.61	1.38	1.53	1.49	6.01 *
North-western Slopes ...	Boggabri ...	20.33	2.58	1.91	1.67	1.66	1.26	6.50 *
Southern Tablelands ...	Yass	23.88	2.13	1.80	1.30	1.85	1.90	7.08 †
Central Tablelands ...	Cowra	22.28	2.38	1.54	1.35	1.86	1.78	7.13 †
Hunter, Hastings and Manning.	Denman	20.12	2.21	2.30	1.74	1.81	1.60	7.45 *

* 4 months January to April.

† 4 months December to March.

NOTE.—Northern Tablelands, North Coast and South Coast not included in the above table.

It is evident from Table II that there are no parts in New South Wales which have a sufficiently low average summer rainfall, on the standards set up by Mackie, Snyder and Smith[4] (less than 1 inch over four months), to produce clean seed, unless disease-free seed is used in the first place. Some localities in the Western and Riverina divisions are just within the borderline limit of 3 inches set up by Mackie, Snyder and Smith[4]. No figures have been included in Table II for the South Coast, North Coast and Northern Tablelands, as all recording stations in these divisions average more than 2 inches per month over the four months summer period.

area for clean seed production, unless clean seed is used for planting the seed crop or unless thorough roguing is carried out.

One other fact of interest arising from a consideration of the figures in Table III is the amount of summer rainfall in relation to the necessity for irrigation. Experience has shown that in almost all seasons payable crops of bean seed can be grown without irrigation on the South Coast, Northern Tablelands and at Maitland. Except in unusually wet summers, irrigation is essential for the production of payable crops at Hillston, Leeton, Gilgandra, Dubbo, Wellington and Muswellbrook. Irrigation is almost always essential at Mudgee and Bathurst and desirable, though not essential at Tumut.

TABLE III.—Average annual and monthly precipitation for the 30-year period 1911–40, with special reference to that occurring over a selected four months growing season for bean seed-growing localities in New South Wales.

Division.	Weather Station.	Average Rainfall (inches).						Four Months Growing Period.
		Annual.	Dec.	Jan.	Feb.	Mar.	Apr.	
Riverina	Hillston	13.78	1.39	1.13	0.93	0.93	1.03	4.02 *
	Leeton	16.13	1.24	1.22	0.86	1.03	1.47	4.58 *
Central-western Plains	Gilgandra ...	19.58	2.10	1.66	1.50	1.60	1.55	6.31 *
South-western Slopes ...	Tumut	31.42	2.28	1.85	1.70	2.36	2.49	8.19 †
Central-western Slopes	Dubbo	20.91	1.87	2.00	1.49	1.99	1.77	7.25 *
	Wellington ...	22.31	2.19	1.91	1.31	1.81	1.83	6.86 *
Central Tablelands ...	Mudgee	24.02	2.47	2.15	1.76	2.01	1.73	8.39 †
	Bathurst ...	22.56	2.49	2.18	1.73	1.99	1.51	8.39 †
Hunter, Hastings and Manning.	Muswellbrook ...	23.55	2.72	2.52	1.83	2.22	2.04	8.61 *
	Maitland ...	33.35	3.63	3.00	2.83	3.28	4.06	13.17 *
Northern Tablelands ‡	Tenterfield ...	30.18	4.06	4.00	2.92	2.62	1.84	13.60 †
	Glen Innes ...	31.32	4.40	3.85	2.87	2.33	1.60	13.45 †
	Guyra	34.13	4.05	3.97	3.06	2.81	2.18	13.89 †
	Armidale... ...	28.98	3.41	3.88	2.81	2.26	1.87	12.36 †
South Coast ‖	Araluen	35.02	3.15	3.52	3.38	3.41	2.91	13.46 †
	Moruya Heads ...	35.71	3.10	4.47	3.13	4.00	3.40	14.70 †
	Bodalla	36.80	3.53	4.50	3.43	4.04	3.32	15.50 †
	Bega	35.92	3.58	4.07	3.73	4.10	3.14	15.48 †
	Eden	34.47	2.47	4.13	3.24	3.46	3.10	13.30 †

* 4 months January to April.

† 4 months December to March.

‡ Major Navy bean growing area in New South Wales.

‖ Major French bean seed growing area in New South Wales.

Table III gives rainfall figures for localities in New South Wales where bean seed has been or is being grown. Included in Table III are the relatively high rainfall French bean seed and Navy bean areas of the South Coast and Northern Tablelands respectively. It is evident that, on American standards, none of the areas where we have grown bean seed in New South Wales can be considered a reliable

It appears that with a four months summer rainfall of 12 to 14 inches, irrigation is not essential for the production of bean seed, but that with a rainfall for this period of less than 8 inches, irrigation is required. A figure of 10 inches for the

four months summer period could probably be taken as an arbitrary borderline figure.

Other factors, such as the average total rainfall for the year and the rate of evaporation, would have to be considered. For example, experience has been that, without irrigation, Tumut is a better area for bean seed production than Muswellbrook, Mudgee and Bathurst, despite the fact that the four stations have about the same summer rainfall. Tumut, however, has a higher annual rainfall than the other localities, and there is normally a greater reserve of moisture in the soil from winter rain for the summer-grown bean crop.

It will be noted in Table 1 that the non-irrigated bean seed growing areas in New York and Michigan have a four months summer rainfall of 10 to 13 inches.

Rainfall in Relation to the Certification of Bean Seed.

The production of French bean seed in areas such as Dubbo, Wellington and Leeton, though giving fairly satisfactory control of seed-borne diseases, particularly if crops were well rogued for disease, did no more than supply most of the Tweed Wonder and Wellington Wonder and a small proportion of the Brown Beauty seed requirements in this State. Largely as the result of the efforts of Dr. C. J. Magee, Mr. A. C. Orman and Mr. T. B. Kiely of this Department and of Mr. E. C. Rumsey of United Seed Growers, a French Bean Seed Certification Scheme was commenced in New South Wales in the 1943-44 season. Details of the scheme and reports on its progress have been published in this *Gazette*[2]. This scheme was designed mainly to produce seed free of the major seed-borne disease, and a zero tolerance has been placed on halo blight, American common blight and anthracnose. It involves thorough inspections of seed crops by Departmental officers and the supervision of harvest and post-harvest operations, as well as certain requirements in relation to seed origin, land eligibility, isolation and varietal purity. The major effort has been directed towards building up supplies of disease-free seed of Brown Beauty, a variety susceptible to halo blight and now our main commercial variety of French beans. Other varieties included in the Scheme have been Hawkesbury Wonder, Tweed Wonder, Wellington Wonder and Canadian Wonder. It is possible that in future years the Scheme will also embrace other varieties of French beans, wax beans, climbing beans, the refugee types used for canning and Navy beans.

Up to the present time practically all of the French bean crops submitted for certification have been from the South Coast, where bean seed production has developed over the last fifteen years largely as a result of a movement northwards up the coast from Orbost and other centres in East Gippsland (Victoria) following the introduction of halo blight. It has been found that the detection of the bacterial blight diseases in bean crops is much easier in the case of crops grown under relatively high rainfall conditions. For this reason, it is considered that more reliance can be placed on field inspections to locate any of the bacterial blight diseases or anthracnose in the case of a seed crop on the South Coast than in the case of a seed crop grown in a district such as Dubbo or Leeton.

Another factor to be considered is that the cost of production of seed is considerably less where there is no necessity to use irrigation water.

Although there have been certain disappointments and set backs in the Certification Scheme, mainly due to the difficulties of detecting trace infection and to stray admixtures of diseased seed with certified seed after harvesting, the Scheme has progressed fairly satisfactorily to date. Provided that the efforts of this Department, of seed growers and of seed merchants are sustained, there is every reason to hope that the Certification Scheme will provide the answer to the problem of clean bean seed, which earlier efforts at seed production in the drier areas of this State only partially solved. Satisfactory commercial varieties resistant to all the major seed-borne diseases would also be an answer to the problem.

Summary and Conclusions.

1. The most important seed-borne diseases of beans in this State are halo blight in the case of most varieties of dwarf French beans and American common blight in the case of Navy beans.

2. Judging from American experience, there are no areas in New South Wales with a sufficiently low summer rainfall to permit

of the consistent production of blight-free seed of susceptible varieties unless clean seed is used for the seed crop or thorough roguing is carried out—although seed grown in the drier areas is, as a rule, less affected with the bacterial blight diseases and anthracnose than seed grown in the moister coast and tableland districts.

3. It is considered that a rainfall of about 10 inches over a four months summer growing period is required in most parts of New South Wales for the production of payable crops of bean seed, unless irrigation is used.

4. The detection of trace infection with the bacterial blight diseases and anthracnose is rendered easier in high rainfall areas such as the South Coast and, for this reason, the Seed Certification Scheme is easier to conduct in a high summer rainfall area.

5. The problem of clean bean seed of susceptible varieties appears more likely to be solved in this country by a certification scheme having a zero tolerance for halo blight, American common blight and anthracnose, than by reliance on dry conditions to prevent spread of these diseases.

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"To-Morrow is Theirs."

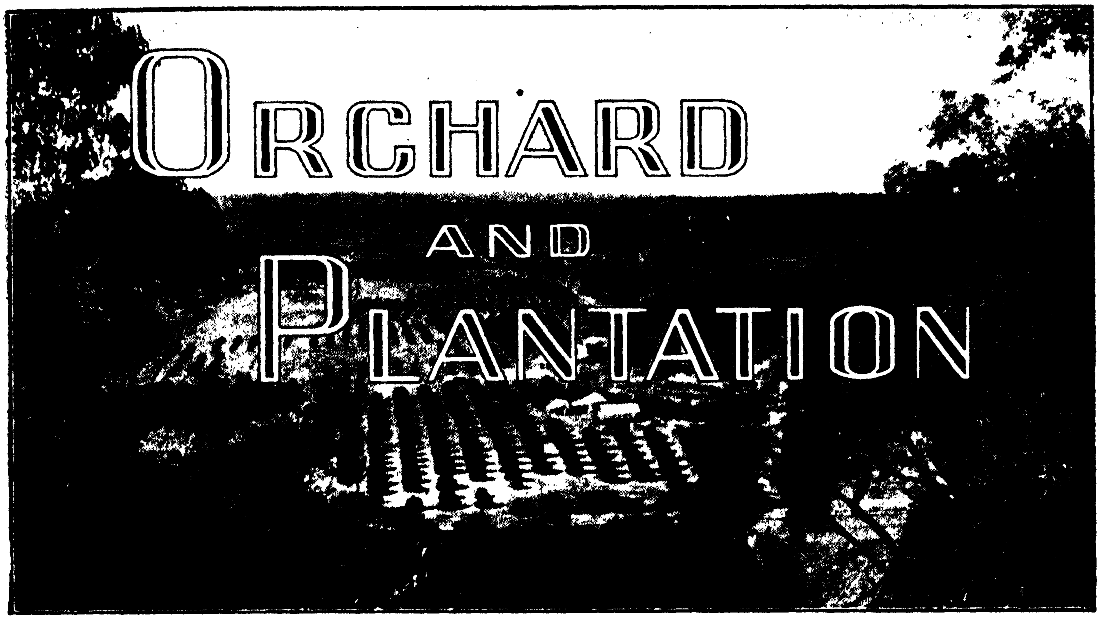
The Present and Future of Education in New South Wales.

IN what is probably the first book ever to deal with the present and future of education in this State, the Minister of Education, the Hon. R. J. Heffron, M.L.A., has made a strong plea for a livelier sense of public responsibility in this matter.

The book, captioned "To-morrow is Theirs," will be available from the Government Printer, Sydney early in the New Year. It has been written primarily for parents, but nevertheless it concerns everyone and is a challenge to every member of the community.

Every aspect of educational administration is dealt with, and throughout its 138 pages there are 146 illustrations, five of them in colour, ranging from nursery schools to adult education. A section is devoted to current expenditure on education and an estimate is furnished of the cost of providing educational services in New South Wales on a short- and a long-term basis.

The price is 1s., including postage, and copies may be ordered and paid for in advance from the Government Printer, Phillip-street, Sydney.



IRRIGATION AND DRAINAGE

In Coastal Citrus Orchards.

●

E. C. LEVITT, H.D.A., Fruit Instructor.

A CONSIDERABLE increase in the area of citrus trees being irrigated is occurring in coastal districts each year, and striking benefits are being obtained. There is, unfortunately, a tendency among those fortunate enough to have a good supply to over-water.

The ill-effects of over-watering are seldom seen immediately, and root damage can become extensive before any decline in vigour of the top growth makes the trouble apparent.

Many Coastal Soils are Shallow.

Many of our coastal soils are comparatively shallow, with subsoils ranging from porous gravel to non-porous clays, and, in many cases, rock. Furthermore, all or any of these conditions may occur on the one property, in which case what may be a normal irrigation in one part, may be either excessive or inadequate in another.

The alert grower will give careful thought to the soil and subsoil of his orchard before commencing general irrigation, and will continue to observe moisture movement in the soil by digging holes or by means of the soil auger. In this way over-watering and under-watering can be avoided. The first is both dangerous and wasteful, while the second is wasteful because the results are poor.

Under-drainage is Often Necessary.

In a great many properties it is essential to use underground drains to prevent water soaking down to the non-porous layer on the higher land, and then finding its way along this layer to lower levels where it accumulates, sometimes even appearing as free water on the surface, but more often being a few inches under the surface and out of sight.

The agricultural tile pipe drain is recommended, but stone and other type drains can be useful though not as permanent.

Before draining, study the lay of the land and, by use of the spade or soil auger, ascertain the subsoil formation—which varies considerably in depth. Then design the drains to intercept the water as it flows along

the impervious band, and take it away before it can reach and saturate the land lower down the slope.

Such drains are termed "interception" drains. They may be discharged into an open drain or natural water easement on the property, or, failing this, into a larger diameter pipeline laid conveniently to collect the water from the "interception" lines and discharge it at a convenient point—usually into a natural water easement. "Spot" drains may be required in odd places to take water from the underground basin.

The size of the pipe to use and the distance apart of the lines will vary with the area to be drained—2 inch diameter pipes are adequate as interceptors for lengths up to 600 feet in most situations, and main discharge lines should be 6 inches.

Distance apart will depend on the soil type, but the closer they are the better the job. Depth is most important and has a bearing on the distance apart of the lines. The usual practice is to place the tiles into the impervious layer, taking care to maintain the fall in grade. Give them a good bed—they are to lie there for a long time.

Soil Condition as a Guide to Need for Irrigation.

Even where an adequate under-drainage system has been installed, excess watering is not advisable. Before irrigation water is applied, the moisture condition of the soil should be ascertained — by soil auger or other means — and sufficient water only applied to wet the soil to the depth of the root zone.

APPLE GROWING IN NEW SOUTH WALES.

(Continued from vol. 57, page 640.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

THIS article commenced in August issue, and this is the fifth instalment. To date the authors have dealt with the suitability of districts, soils and vaireties, and (in December issue) have discussed the matter of stocks for apple propagation. In the present instalment the influence of picking and harvesting methods on the storage life of the fruit and the returns to the grower, is described, and some views are expressed on control of pre-harvest drop.

Harvesting.

The harvesting of apples far too frequently receives much less attention than is warranted by the importance of this operation.

Picking is often regarded as an unskilled job—and, up to a point, perhaps, it is—and the marketing of early cooking apples locally or through an outlet which is not far distant, when size is practically the only consideration, does not call for a great amount of skill; but as the period between picking and consumption lengthens, the harvesting operations call for judgment and experience to an increasing extent. With late maturing apples intended for cool storage, the date of picking and the methods of handling may have a very definite effect on the behaviour of the fruit during and after cool storage.

In between these two extremes we have, probably, the bulk of the apple crop, which is marketed directly after picking, mainly as dessert fruit, and the quantity of such fruit which is yearly placed on the market in poor condition, due mainly to picking in an immature condition and faulty handling, should convince anyone that harvesting is not as simple a matter as many apparently believe.

Apart from the cooking apples, with which size is the primary consideration, the most important points to be considered in apple harvesting may be summed up briefly as follows:—

1. It is necessary to pick at the correct stage according to the purpose for which the fruit is intended, *i.e.*, immediate marketing, cool storage, etc.

2. Fruit from the lighter soils has a longer storage life than fruit from heavy soils.

3. Fruit from young trees, or from mature trees carrying light crops, is not suitable for long storage.

4. Very large fruit of a variety will usually break down more quickly than medium sizes under storage conditions.

Picking a Heavy Crop from Healthy and Vigorous Trees.

5. Very small fruit and low grade fruit will seldom pay for the trouble and expense involved in cool storage.

All these points influence the ultimate condition of the fruit when it reaches the consumer, and consequently the returns to the grower.

Considerable judgment may be needed when deciding whether or not to pick apples for storage—particularly for long period cold storage—in order to avoid loss from faults that are not always obvious at the time. An unsound decision, resulting in the storage of unsuitable fruit, may eventually mean the sale of the fruit at a price below a profitable level, especially if sold on a heavily supplied market.

Indications of Maturity.

Apart from early culinary varieties, apples intended for any purpose will not yield the best results unless picked at the correct stage of ripeness.

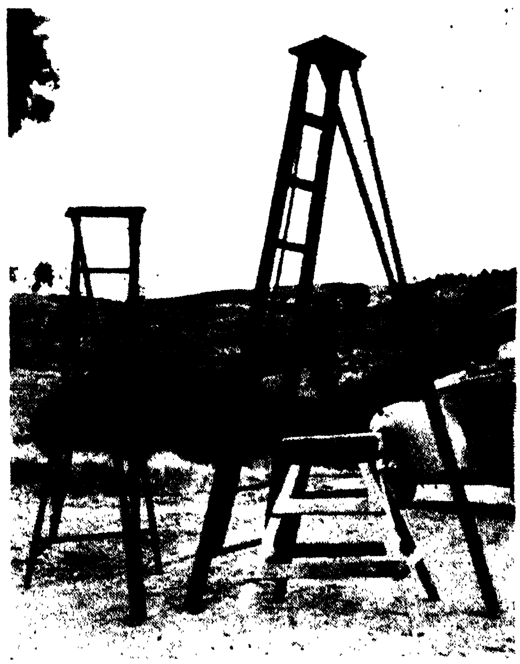
From time to time various aids in determining this stage, such as colour charts, pressure tests, iodine tests, descriptive writing, etc., have been advocated, but under practical conditions none has yet been found to be a completely satisfactory substitute for a practical knowledge of apple maturity. The browning of the pips is often relied on, but by itself is a very unreliable guide, as in certain seasons the pips may become brown long before the correct degree of picking maturity is attained.

A sure sign of approaching maturity is the change in ground colour, from a decided green to a lighter shade of green; and the flesh, as the apple matures, gradually loses its woody texture and shows an increasing degree of crispness and juiciness. When tasted the fruit should have an indication of sweetness and flavour characteristic of the variety when ripe. As ripening progresses the stalk will part more readily at its union with the spur, and in coloured varieties, naturally, the increased development of colour is an indication of ripening.

However, all such indications may convey very little to the uninitiated, and thus no small degree of experience and skill is necessary if the best results in harvesting are to be obtained.

Picking Apples.

It is seldom, if ever, that all fruits on a tree attain the correct stage of maturity at once, hence several pickings are needed in most instances.



Well-built and Solidly-constructed Ladders and Picking Stools are a Necessity for Picking.

The permanent staff of an apple orchard is usually supplemented by additional hands at harvesting time, and very often such hands are, for the most part, quite inexperienced, or, at best, only semi-skilled. Supervision of picking in such cases must, therefore, be close and constant if the standard of maturity which has been set is to be maintained, and injury to fruit avoided.

Careful handling to avoid injury to the fruit should be the constant care of the grower, as considerable wastage from bruising and rotting can occur through rough handling. Bruising and skin injury can be caused by:—

1. Dropping fruit, instead of placing it in picking bags.

2. Pressing picking bags containing fruit against ladders whilst picking.

3. Over-filling field cases.

4. Dropping fruit from picking bags into cases—instead of allowing it to run in a steady stream.

5. Over-filling picking bags.

6. Grit and rubbish in picking bags and cases.

7. Long finger nails, which may cause considerable skin injury.

8. Roughly sawn and made field cases used without liners.

When picking from a ladder it is advisable to work from the top of the tree down, and picked fruit should be kept in the shade as much as possible until it can be carted into the shed. Unless specially made field cases are used, strawboards or other lining material should always be used as a protection against case rubbing caused by the rough inner faces of the case sides, etc.

Fruit intended for long period storage should be handled particularly carefully, as skin punctures under such circumstances are a prolific cause of decay in store, following the entry of rot organisms.

Pre-harvest Drop.

So-called hormone sprays are now largely used in pome fruit orchards throughout the State to prevent the loss—serious in some instances—which otherwise occurs as the result of the falling of fruit which is practically mature just prior to harvesting. This pre-harvest drop occurs particularly in the case of varieties such as McIntosh Red and

Considerable Quantities of High Quality Fruit Similar to that Shown in this Illustration are Spoiled Every Year By Faulty Handling.

Gravenstein, and to a lesser extent in Jonathan, Delicious and Rome Beauty varieties.

Much attention has been given in recent years to the practical application of the discovery, years ago, of the plant growing substances or plant hormones, of which naphthalene acetic acid is possibly the best known.

There is no doubt of the effectiveness of the hormone sprays if the work is thoroughly done. The hormone substances are absorbed by the plant tissues and apparently result in increased cellular activity, thus strengthening the tissues around the point of abscission, *i.e.*, where the fruit pedicel is attached to the spur.

It should be apparent, then, that to be fully effective, the spray must in particular be applied to those parts most concerned, but as it is impossible, under field conditions, to spray the fruit stalks only, it becomes necessary to drench the whole tree thoroughly—paying particular attention to the fruit clusters where possible.

Results, therefore, from this type of spraying can only be in direct relationship to the thoroughness of application. Wisely used, these sprays can be the means of saving large quantities of fruit which in the ordinary course of events would be wasted during dry seasons.

A word of warning is perhaps necessary, however. It is quite possible by the use of hormone sprays to hold the fruit on the trees longer than is desirable for best keeping quality, and particularly in the case of apples intended for cool storage, care should be taken that the picking period is not unduly prolonged merely because the fruit is not dropping as freely as it usually does in the case of untreated trees. It must be kept in mind that these sprays do not retard the normal ripening of the fruit.

Hormone Sprays, Applied at the Correct Time, Can Prevent a Large Proportion of Pre-harvest Drop such as Shown in this Illustration.

(*To be continued.*)

Use of Trifoliata Stock for Citrus.

THE advantage of using *trifoliata* stock for citrus in land subject to phytophthora root rot has been strikingly demonstrated in a Castlereagh orchard where navel orange trees in a declining section were inarched with *trifoliata* seedlings in 1940. These trees are now the only survivors in this portion of the orchard, despite the fact that many of the trees now dead were more vigorous than those inarched.

A further example occurs in the same orchard where twelve Marsh grapefruit on *trifoliata* stock are maintaining their health and vigour, while surrounding trees on rough lemon stock are either dead or seriously declining.—*Division of Horticulture.*

A Successful Campaign.

BUNCHY TOP DISEASE OF BANANAS

Controlled by Co-operative Effort.

(*Concluded from vol. 57, page 646.*)

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

IN this article (of which this instalment is the third and final), the author describes the establishment of the banana growing industry in this State, its destruction by bunchy top disease and the success which has been achieved in its rehabilitation by the effective co-operation of the grower's organisation with Departmental officers.

In this concluding section Mr. Eastwood describes the attempts at eradication of the disease at Yarrahappini, and indicates the efficiency of the control measures now in force, by comparing the incidence of the disease in 1945-46 and the insignificant losses experienced, with those of ten years ago.

An Eradication Campaign.

As mentioned earlier in this article eradication of bunchy top disease has been attempted in the extreme southern banana region. This was accomplished in and between the Manning and Macleay river districts, excepting at Yarrahappini.

These territories, which are not as climatically suitable as the northern districts for banana growing, have a few commercial plantations, mainly at Johns River and had hundreds of small plots and clumps of bananas in backyards and along the river banks. Where these patches were neglected, unregistered, infected with Panama or bunchy top disease, they were ordered to be destroyed. Inspections were made every two months, and by insisting on this procedure, bunchy top was eradicated within a few years in this region.

Failure at Yarrahappini.

The disease was found over twenty years ago at Yarrahappini, which is situated 6 miles north-west of the entrance of

Bunchy Top Plantation Dug Out.
Good plantations in the background.
[*Photo by R. W. Norris.*

the Macleay River and 2 miles inland. The presence of bunchy top in this locality was dangerous to the clean districts of Nambucca and Coff's Harbour, as they are only 8 and 35 miles respectively to the north by direct air line.

Special precautions had already been taken to keep these clean districts free of bunchy top by prohibiting the entry of any banana plants whatsoever. This was expedient, because they were important commercial growing areas, besides being the only source of supply of plants in the State free of both bunchy top and beetle borer. To give further protection and ultimate security from bunchy top disease to the Nambucca and Coffs Harbour districts, it was decided to attempt the eradication of the disease at Yarrahappini.

This could have been achieved in a short space of time, as was done in the Manning and Macleay River districts, by completely destroying plantations in which the disease appeared, but it was determined to test out the efficacy of the present regulations as another method of eradication by carrying out detailed and frequent inspections. In addition, this practice did not cause the same hardships to growers as the compulsory destruction of their plantations.

Yarrahappini, being an isolated and small localised area of about 90 acres of bananas amongst ten growers, provided an excellent "set-up" for this experiment. There was no disease to the south or west, and the nearest bunchy top to Yarrahappini was in the Clarence River district about 75 miles to the north, so there was no danger of outside infection.

The eradication campaign was commenced at Yarrahappini on 1st March, 1937, and part of this campaign was an immediate and detailed survey of the whole district to make sure that there were no remnants of plantations, hidden or neglected stools of bananas that were bunchy top infected or had not been thoroughly destroyed. Diseased plantations at Way Way and Warrell Creek on the other side of the Yarrahappini mountain were destroyed in this "clean-up" campaign, and remaining plantations were kept under strict personal supervision. Early inspections revealed slight infections of bunchy top in seven plantations comprising 51 acres at Yarrahappini. The disease was soon confined to five plantations, and progressive reduction terminating in complete eradication was expected within a few years.

"Leaf to leaf" inspections of diseased plantations were carried out every ten days during the growing season, and every three weeks during the winter period. Healthy plantations were inspected at regular intervals. More intensive inspections were unnecessary and not warranted.

Diseased stools were thoroughly sprayed with power kerosene, completely dug out, cut up into small pieces and resprayed again on the ground. Adjacent stools on a "three pin point" system were carefully sprayed with nicotine sulphate.

Growers willingly assisted the Detectors and Inspectors by desuckering their plantations to a "two-plant two-sucker" system, keeping them reasonably free of weeds and by stripping the stools free of trash, all of which provided congenial conditions for inspections. Everything possible was done to guard against any likely weakness in this method of eradication, even to destroying healthy stools contiguous to diseased ones on a "two pin point" system for twelve months.

The movement and planting of suckers was prohibited for seven and a half years from February, 1938, to September, 1945.

The following table is presented to show the progress of the campaign from 1st March, 1937, to 30th June, 1946.

BUNCHY TOP ERADICATION CAMPAIGN AT YARRAHAPPINI.

Year ended 30 June.	Actual Acreage	Acreage Inspected.	Bunchy Top.	Remarks.
1937 ...	83	162	14	Four months only—from 1st March to 30th June.
1938 ...	94	985	100	Planting prohibited from 11t February, 1938.
1939 ...	88	1,944	15	
1940 ...	87	1,842	2	
1941 ...	87	1,727	4	Latent infection.
1942 ...	86	745	1	Latent infection found 7th January, 1942 — Twelve months since found in plantation.
1943 ...	84	603	4	Found July, Sept., Oct. and 2nd December, 1942, in two plantations.
1944 ...	84	476	Nil.	
1945 ...	66	387	Nil.	Planting permitted September, 1945.
1946 ...	153	544	1	Found 8th January, 1946—last found in plantation 2nd December, 1942, i.e., 3 years 1 month.

From this table it will be noted that very encouraging results were obtained in reduc-

ing the disease up till 1940, but since then the progress has been disappointing. No diseased plants were found for nearly three years prior to planting being permitted in September, 1945. This period of freedom from disease was such as to warrant the lifting of the planting restrictions, and moreover it was anticipated that the disease was eradicated. Unfortunately a further six adjacent stools were found four months later in the same plantation as the previous bunchy top found in 1942.

The disease has never spread from the infected plantations to any healthy plantations since the campaign was inaugurated, and has been confined to five plantations since May, 1938. Of these five areas it is 6 years 8 months, 5 years 8 months, 4 years 7 months, 4 years 1 month and 7 months respectively since bunchy top was found. No disease was found in the latter plantation for 3 years 1 month until 7 months ago.

The most disconcerting aspect of this eradication campaign is that bunchy top lies dormant in the plant. Practical evidence of this happening was first observed in 1941, and since then other instances have occurred. At first it was thought that latency would only prevail for two growing seasons covering eighteen months, but it is now recognised that it may persist for an indefinite period. Under these circumstances eliminating the disease within a decade is most difficult to achieve unless all the plantations in which bunchy top has been found are completely eradicated.

A Healthy Banana Plantation.

[*Photo by Russell Roberts Pty. Ltd.*

Much useful data and knowledge has been collected in conducting this trial which can be used to good advantage in any future eradication scheme undertaken in this State.

It was early realised that it would have been more economical, with a minimum of responsibility to all concerned, if growers who had infected plantations in 1937 had been compensated and the areas destroyed.

This possibility was not overlooked at the time, and inquiries made showed that the seven plantations in question, embracing 51 acres, could have been purchased at the growers' figures for £2,741 and then destroyed for £204, making a total expenditure of £2,945.

From the 1st March, 1937, to 30th June, 1946, the eradication campaign at Yarrahappini cost the Banana Growers' Federation £3,950, which does not include indirect expenses—and the disease still persists in at least one plantation.

Extensive Knowledge Now Available.

Since Australia is primarily an agricultural country it is advantageous to know accurately what the serious annual and occasional colossal losses from plant disease mean to the farmer or orchardist, to the State, to the country—and the reduction they cause in the national income.

Only meagre figures based on inadequate reports and incomplete records are available in this country to indicate the losses occasioned by plant diseases generally. Reliable information can only be obtained by extensive surveys and careful analysis. This is now available about bunchy top disease in this State—from the records and data collected and collated yearly, and from the continuous inspection and survey system operating in the banana industry. Exhaustive knowledge on all aspects of bunchy top disease is accumulating, and becomes more valuable each year. Such detailed information is not available about any other plant disease in Australia.

Great Savings Effected.

Bananas are planted varying distances apart, but the usual distance is 10 feet square, requiring 435 stools to the acre.

During the 1936-37 financial year, 42,305 bunchy top stools were found, representing 97.25 acres. As there were 15,745 acres in the State that year, the loss from bunchy top was .618 per cent. of the acreage. The

BANANA-GROWING STATISTICS 1945-46—COMPILED IN DISTRICTS.

District.	Zone.	Acreage at 1st April, 1945.	Acreage Planted 1945-46.	Acreage Destroyed 1945-46.	Increase.	Decrease.	Total Acreage 1st April, 1946.	No. of growers 1 acre and over.	No. of growers less than 1 acre.	Approx. Total Acreage under 1 acre.
Tweed River	1	2,125¼	391¼	105½	285¾	...	2,411	278	30	3
" "	2	1,140¾	330½	63¾	266¾	...	1,407½	209	73	8
" "	3	1,675¼	457¼	74	383¼	...	2,058½	311	23	2
" "	4	527¼	126	41½	84½	...	611¾	101	4	1
Total		5,468½	1,305	284¾	1,020¼	...	6,488¾	899	130	14
Brunswick River	5	4,922¾	1,095¾	337½	758¼	...	5,681	823	90	15¼
Richmond River	6	355¼	199¾	30¾	169	...	524¼	110	204	29
" "	7	838¾	347¼	54½	292¾	...	1,131½	208	176	24½
" "	8	1,409½	483¼	72	411¼	...	1,820¾	316	75	13
" "	8A	503¾	119½	32	87½	...	591¼	117	52	5½
" "	14	12½	16½	4	12½	...	25	8	16	1
Total		3,119¾	1,166¼	193¼	973		4,092¾	759	523	73
Clarence River	9	191	94½	10	84½	...	275½	53	369	40
" "	10	....	......	0	......	...	...	...	2	¼
" "	12	7½	......	7½	......	7½	.....	...	2	¼
Total*		198½	94½	17½	77	...	275½	53	373	40½
Coffs Harbour & Woolgoolga	11	2,932¾	469	157¾	311¼	...	3,244	409	187	58
Macksville, Kempsey, and Port Macquarie	13	1,306½	277¾	77	200¾	...	1,507¼	158	116	6¾
" " "	16	167½	32	6	26	...	193½	38	61	5¼
" " "	*16Y	65¾	87	......	87	...	152¾	28	4	½
" " "	17	28	......	......	......	...	28	10	22	2½
Total		1,567¾	396¾	83	313¾	...	1,881½	234	203	15
Total for Zones 1-17		18,210	4,527¼	1,073¾	3,453½	...	21,663½	3,177	1,506	215¾

* Zone 16Y is Yarrahappini.

average production per acre was 66 Tropical cases, so that bunchy top disease reduced the yield by 6,418 cases. This represents a loss £5,075 to the industry, or £3,172 to the growers as the wholesale price on the Sydney market was 16s. per case.

Only 5,144 bunchy top stools were found during the 1945-46 financial year, which represents 11.8 acres. As there were 21,663 acres in the State, the loss from bunchy top was .054 per cent. of the acreage which is a decrease of 1,144 per cent. in the incidence of the disease since 1936-37. The average production per acre for 1945-46 was 91 Tropical cases, so that bunchy top reduced the yield by 1,074 Tropical cases this year.

In 1937 the loss from bunchy top was 97.25 acres whereas in 1946 it was only 11.8 acres which is a reduction of 85.45 acres. This saving represents 7,776 Tropical cases at 91 cases per acre. The wholesale price for bananas on the Sydney market in 1946 was 43s. per case, so the improvement to the industry was £16,718, of which the growers' share was £12,830.

Production for 1945-46 was 1,347,993 Tropical cases, and the loss from bunchy top was one case in every 1,255 cases marketed, which only amounted to £2,309—and the industry was worth £2,898,185 to the State. This was the maximum loss, as all infected stools were not found in bearing plantations on which all production figures are computed. If there were no control measures the losses from bunchy top disease could be imagined!

A Triumph for Practical Co-operation.

That the Co-operative Bunchy Top Control Campaign which is now recognised as unique in successful disease control methods in Australia is rendering a good service to the industry, is indicated by the present State acreage of 21,663 acres shown in the accompanying statistics, which is only 626 acres less than the record acreage of 22,289 acres in 1933-34.

The success of the campaign is a triumph for practical co-operation between the banana growers and their leaders and Departmental officers—so often talked and written about in agriculture, but seldom accomplished.

Potash is Essential to Citrus Tree Nutrition.

A FURTHER indication that potash is essential to citrus tree nutrition has been obtained in a trial at Kenthurst on young navel oranges. These trees grew well for four years, and then became quite unsatisfactory in both growth and cropping, despite liberal nitrogen and phosphoric acid fertilising. At the Department's suggestion an application of sulphate of potash at the rate of 5 lb. per tree was given to one row of fourteen trees on 7th May, 1945. In the recent harvest this row of trees picked 10½ bushels of fruit; on comparable rows, omitting those immediately adjacent, which carried six bushels each, the average was 3.7 bushels.

The trial is being continued, and some interesting results are expected. The grower, one of the largest in the Hills district, who had for many years been convinced that potash was of no value to citrus, has incorporated it in the whole of his manurial programme this season.

Growers on soil types similar to that referred to who find it impossible to obtain potash are recommended to use a mixed fertiliser with a maximum percentage of potash.—E. C. LEVITT, Fruit Instructor.

Teaching Calves to Drink from a Bucket.

USUALLY not much difficulty is experienced in teaching a young calf to drink from a bucket. Back the calf into a corner and stand astride it, holding it in position. Then hold the pail in one hand, dip the fingers of the other in the milk, and while the calf is sucking the fingers, bring its mouth down into the milk; then gradually withdraw the fingers. This may have to be repeated several times.

If possible, during the first two or three weeks of life feed the calf on milk from its mother, or, if its own mother's milk cannot be made available, with milk of about the same butterfat content.

Feeding twice daily is adequate with robust calves but with less robust calves three times per day is preferable. Young calves should be fed as soon as possible after the milk has been drawn from the cow and before it has had time to cool down.

The various aspects of calf rearing are fully discussed in a pamphlet obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

INSECT PESTS.

Notes contributed by the Entomological branch

Mites *(Acarina)* in Buildings.

AMONGST the mites found infesting buildings, most frequently submitted to the Entomological Branch for identification and control, are the rat mite (*Liponyssus bacoti*), the tropical bird mite (*Liponyssus bursa*), the poultry mite (*Dermanyssus gallinae*), the hay itch mite (*Pediculoides ventricosus*), various species of tyroglyphid mites (belonging to the genera *Tyroglyphus, Tyrophagus, Glycyphagus*, etc.), and the clover mite (*Bryobia praetiosa*). These mites are introduced species which have spread, probably with their host or infested substances, to various parts of the world, and all have eight legs in their adult stage.

The mites found invading buildings may be parasitic forms from rats or birds or parasites of various insect larvae, or they may be pests from stored foodstuffs. Less frequently they are plant feeders which have wandered into the building in large numbers when migrating.

Mites as a group* are of great economic importance and may attack man, domestic and wild animals, birds, insects, stored products, plants, etc. Some few are beneficial. Microscopic examination is necessary to determine the various species.

Their mouth parts are adapted for biting, piercing and sucking, and they are the most numerous and troublesome members of their class.

Their bites do not cause irritation to all persons, but to those who are allergic to them their bites may give rise to inflamed, itching swellings, often referred to as "hives," which may persist for some days, or severe skin irritation or dermatitis may follow. Some people are allergic to the presence of mites on various substances, and although some of the irritation or "itch" set up may be caused by their bites, some of the symptoms are produced by skin contact with dead mites and mite debris when handling materials infested by them, and also by inhalation of mites and mite dust.

*The mites form a large group of small animals, the *Acarina*, of the class *Arachnida*, in which class, in addition to the mites and ticks, are also included various scorpions and the spiders. These animal forms are related to, but distinct from, insects.

The clover mite is harmless to human beings, but its presence in numbers may occasion concern when seen crawling about.

The rat, bird and poultry species of mites, which measure from about 1/50th to 1/25th inch in length, are pale yellowish-grey with whitish or brownish internal markings when unengorged, but become reddish when engorged with blood.

The Rat Mite.

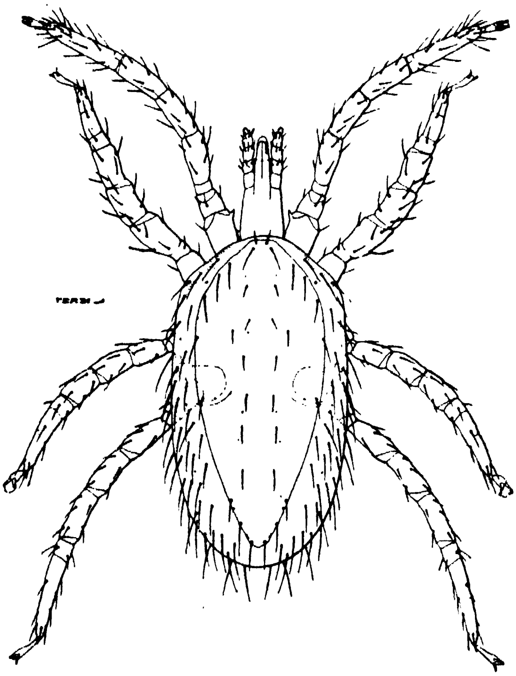
The rat mite is usually a parasite of rats, but it has also been recorded on mice in central-western New South Wales, during a "mouse plague."

This mite spends much, but not all of its life on its host. It moults and lays its eggs in cracks and crevices in the structures of buildings or in rats' nests, and where rats are numerous, mites, in various stages of development, may be found crawling about seeking to return to their natural host, and it is at this time that they readily attack man. They are more numerous during the warmer months of the year and infestations have been found in offices, garages, factories, stores, dwellings, etc., even in places considered to be more or less free from rats.

The Tropical Bird Mite.

The tropical bird mite is a parasite which attacks fowls, cage birds, starlings, etc., and may occur in vast numbers on nesting hens during the warmer months of the year.

They hide by day in cracks and crevices in the perches, under boards and in other places in the vicinity of the birds' perching places or nesting sites. At night, the mites come out to suck the blood of their hosts. If disturbed in their haunts during the day, however, they may be seen crawling quickly over the surfaces of the infested areas and will swarm over the person disturbing them.



The Tropical Bird Mite. [After Hirst.

The eggs are laid in their hiding places, and where infestations of these mites occur the surfaces of materials in the vicinity of their hiding places becomes greyish in appearance, this being due to the quantities of excreta passed by the mites.

The Poultry Mite.

The poultry mite is sometimes referred to as the red mite of poultry on account of its red body when engorged with blood. It has very similar habits to the tropical bird mite, and in the Sydney district, at least, the infestations of "fowl mites" are commonly found to consist of a mixed population of both tropical bird mites and poultry mites.

This mite is able to live for a long time without food, and in experiments, several writers state they have kept these mites alive without food, but supplied with a little moisture, for periods varying from eighty-two to 113 days or more.

Where infestations of either of the above species of bird mites occur in buildings, it is not infrequently found that the mites have migrated from the nesting site of some bird, situated either in a roofing cavity or on the walls outside the building. Migrations of these mites often take place when young birds have left a nest and the parasites wander away, often for considerable distances, in search of food. During this period they may crawl through ventilators, or enter windows, etc., and swarm over the walls and on to fittings or articles of furniture, and so on to persons in contact with them.

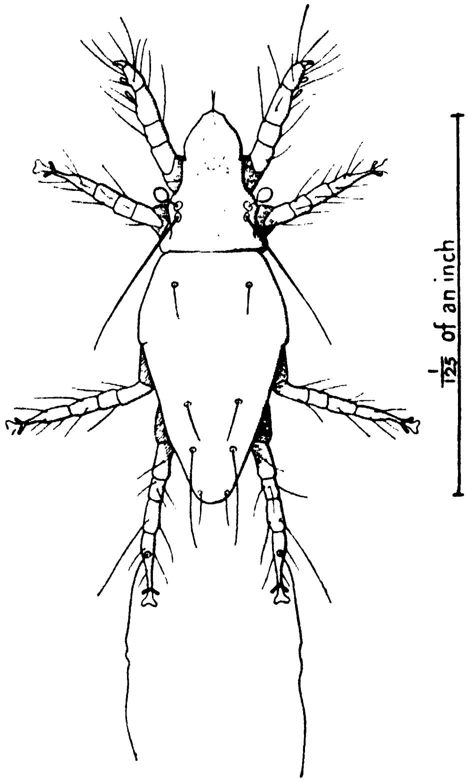
These mites may also be brought into a building on working clothes, and may persist on these for several weeks, or they may wander from the clothing. If the clothes are worn again without having been washed, or otherwise treated, the mites, following on their period of enforced starvation, will readily bite the wearer.

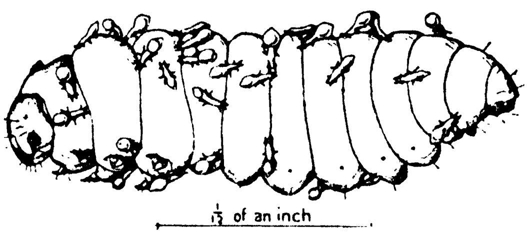
The Hay Itch Mite.

The hay itch mite is mainly an external parasite of the larvae or grubs of various insects and amongst its natural hosts are the larvae of grain weevils, bean "weevils," the common grain moth, etc., that frequently infest stored grain or grain products, beans, etc.

This pale-yellowish mite is very small, being only 1/100th inch in length. The abdomen of the female, after feeding, becomes very distended and the mite is then easily visible to the unaided eye. The eggs hatch within the body of the female and the mites give birth to living, fully-formed, and sexually mature males and females.

Infestations of these mites have been found in stores and factories, etc., where straw containing quantities of insect-infested grain and rice hulls containing grain have been used for packing materials. Large numbers of these mites have also been





Above.—**Female of the Hay Itch Mite.**
Below.—**Grain Moth Caterpillar Infested with Itch Mites.**
[*After Swan.*

found developing in straw mattresses containing insect-infested grain.

Although man is readily attacked by these mites they do not feed for long on the human body, and must feed on one of their natural hosts to complete their development. Where persons are attacked, these mites usually crawl under the clothing and bite the more tender parts of the body; the abdomen, back and sides, and seldom the skin of the exposed parts.

Tyroglyphid Mites.

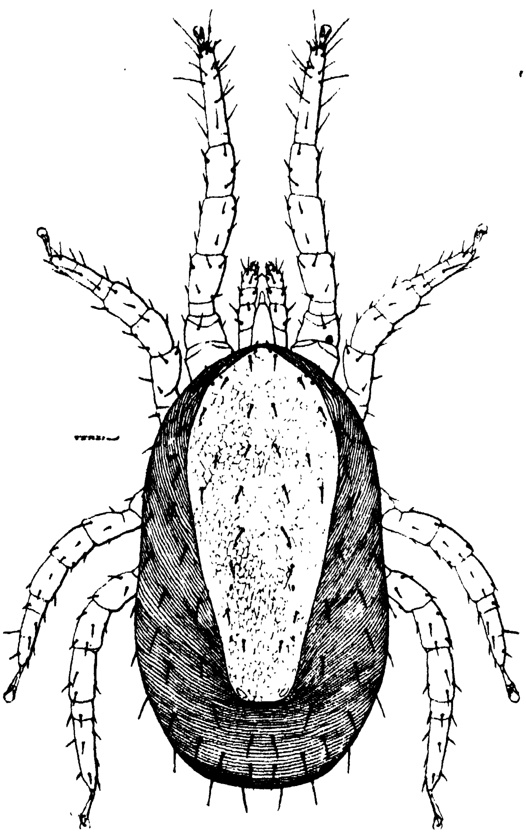
The various species of mites belonging to this group often become numerous amongst stored foodstuffs, etc., particularly when the moisture content is high. These mites may infest such substances as cereals and cereal products, dried meats, pickles, mustard, jam, sugar, dried vegetables and fruits, copra, etc. At times they may also become abundant amongst damp straw, rice hulls, etc., used as packing for various containers.

Cheese, also, may be infested and where this occurs, the mites cause holes in the cheese and foul the surface of it with accumulations of dust, which consist of cast skins, the bodies of dead mites and mite excreta. Such cheeses are distasteful to most people, and if eaten may cause various intestinal disorders. Although this mite is regarded as a pest, there are some few localities in Europe where it has been cultivated in order that the crust on the cheese formed of the living mites, their cast skins, etc., may impart a characteristic flavour to it.

In dwellings, occasionally, enormous numbers of tyroglyphid mites have been found developing on a comparatively small piece of neglected cake or biscuit which has been placed away in a cupboard or cabinet drawer, and left undisturbed. The occupier, later, seeing what appears to be a scum over the polished surface of the cabinet, examines more closely, and realises, sometimes with alarm, that the apparent scum is made up of great numbers of slowly moving mites.

Where tyroglyphid mites are numerous they may occur in countless thousands and swarm along the edges of cases and shelves, and may fall from these to the floor or other surface below, there to form a compact, greyish seething mass.

The tyroglyphids are all small, pale-coloured mites with soft bodies and often with long body bristles. They have more or less spherical bodies and are much less active than their relatives the bird and rat mites. Most of the species lay their eggs amongst their food materials and some of the young forms may pass into a special nymphal stage, known as a hypopal stage, in which there are no mouth parts and the legs are short and not adapted for walking. These mites, which have one or more suckers beneath their bodies, attach themselves to an active insect such as a fly, and are thus transported to another locality. They later



The Poultry Mite.

[*After Hirst.*

detach themselves, cast their skins, and enter their active nymphal or pre-adult stage.

The Clover Mite.

The clover mite, or as it is known to orchardists, the red mite of fruit trees, is a common pest of pome and stone fruit trees, such as apples, pears, almonds, plums, peaches, etc. These mites also feed on clovers and various other plants, and from these, at times, they migrate in considerable numbers and may then invade the lower rooms or basements of buildings in the vicinity.

The adult mites, which measure about 1/30th inch in length, vary greatly in colour. Some may be reddish-brown, others grey or greenish-grey, and their legs may be orange or amber-coloured. The younger forms are red, as are the eggs, which may be laid either singly or in compact masses on their food plants.

Control.

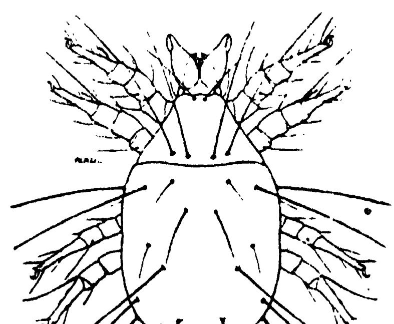
Although microscopic examination is necessary to determine the particular species of mites that may be causing annoyance in a building, where rats are known to be abundant, or a bird's nest is known to be in a cavity in the building, then either rat or bird mites may be suspected of being responsible for the trouble, and control measures for either may be adopted.

The first essential is the removal of the natural hosts of the mites. The rat population should be kept as low as possible by means of traps, poison baits, and by rat-proofing the building, and the elimination of their hiding or nesting places. Birds' nests should be removed from any part of the building and the birds prevented from re-entering.

These mites may be controlled with sprays of kerosene or kerosene extracts of pyrethrum (fly sprays).

The site of a rat's nest or bird's nest should be given particular attention, and it is usually preferable to apply a spray to such areas before removing the nesting materials, which most frequently will be found to be swarming with mites. The materials may then be collected and burnt.

Where the mites are brought into a building from fowls' nests or fowl sheds, then it is necessary to treat this source of infestation, and for this purpose a kerosene emulsion (1 in 10) may be used.



One of the Tyroglyphid Mites.

[*After Hirst.*

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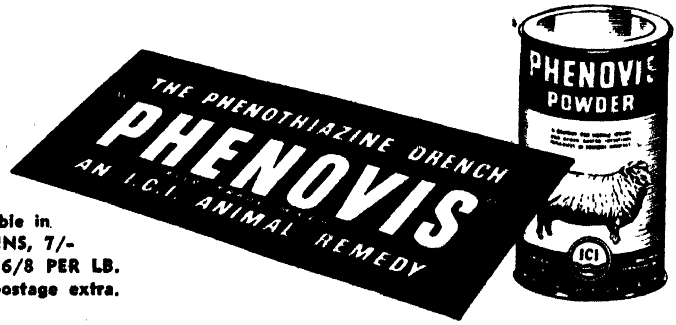

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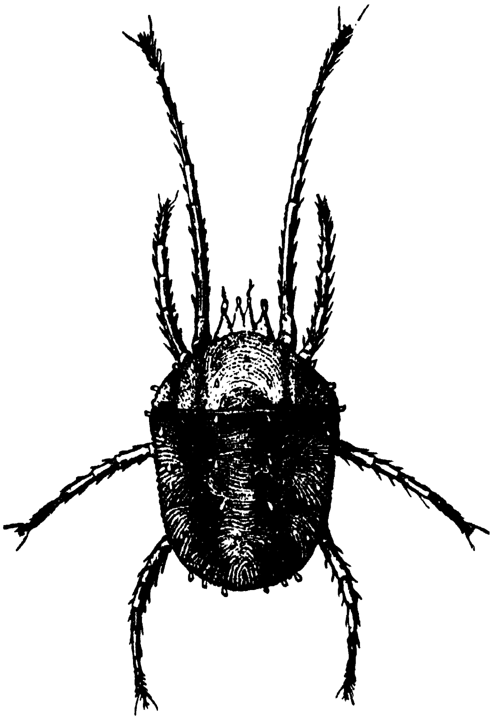
The hay itch mite may be controlled with the kerosene sprays mentioned above, but where these mites are developing on insect larvae infesting foodstuffs, seeds, etc., treatment to kill the insects, or if necessary the destruction of the infested materials, is essential to prevent reinfestation from these sources.



The Clover Mite.

[After Marlatt and Riley.

Although it may be difficult to avoid having a certain amount of grain amongst straw after cutting, the use of straw containing many ears of grain for packing purposes or mattresses, etc., should be avoided as far as possible, unless it has been fumigated or heat-treated first. Mites in bales of straw have been successfully controlled by vacuum fumigation with hydrocyanic acid gas.

Tyroglyphid mites may be controlled by using the abovementioned kerosene sprays, but their eradication largely depends upon the detection and destruction of their original food supply to prevent reinfestation.

Whatever sprays are used against the mites mentioned above, repeated treatments may be necessary to kill stragglers but these individuals, with their food supply eliminated, will gradually become less numerous. Usually, in dwellings, mist sprays of kerosene or kerosene-pyrethrum, applied wherever the mites are seen on walls or furniture, are generally all that is required.

Where large areas are infested and depending upon what substances are attacked, fumigation is often adopted as a means of control and is very effective, but it involves more expense than is usually necessary. In addition, the work of fumigation should only be undertaken by experienced operators.

The clover mites are readily controlled with the kerosene sprays when in a building, and on the plants outside by spraying with a lime-sulphur solution (1 to 35).

A Correction.

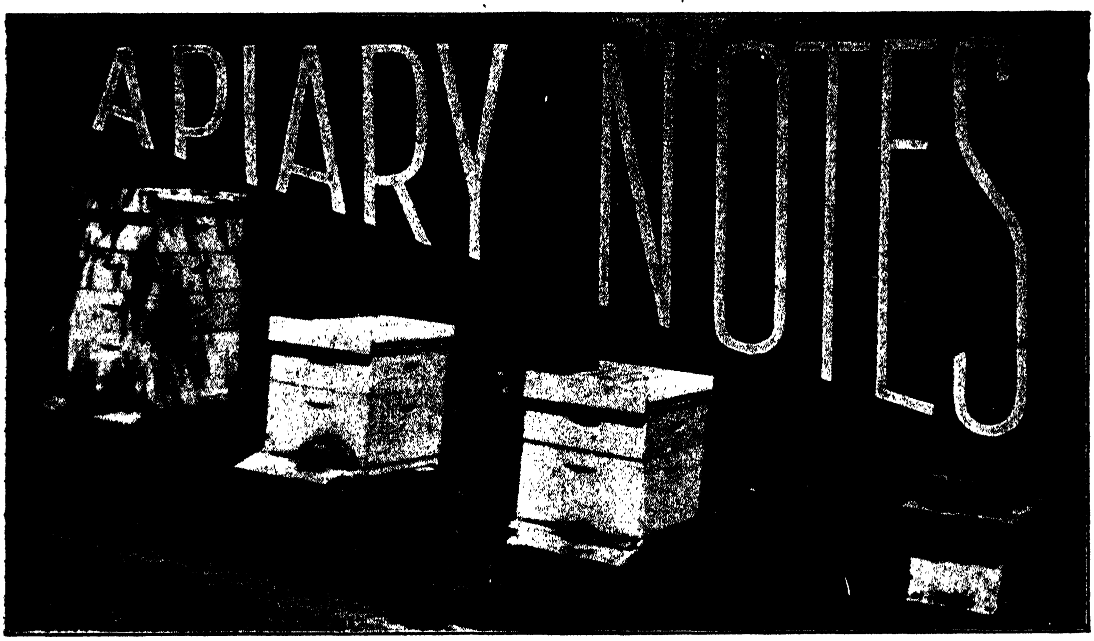
In the December issue of the *Agricultural Gazette*, the formula (B) for the snail bait given on page 660, should read:—

(B) Metaldehyde (finely powdered)	1/3 oz.
Bran	1 lb.
Water	1 pint.

"Mouldy" Flavour in Eggs Caused by Camphor Laurel Leaves.

SPECIMENS of eggs recently referred to the Biological Branch by an Eastwood householder were stated to be inedible because of their mouldy smell and flavour. A hen killed from the same flock was also described as being unfit to eat due to its similar nauseating mouldy flavour.

Examination of these and further specimens of eggs submitted revealed that they had apparently been tainted through the hens having eaten fallen camphor laurel leaves blown into the yard from nearby trees. When diffused, it was possible for the odour to be described as "mouldy"; concentrated, the odour was unquestionably that of the camphor laurel.



BEES IN THE NATIONAL ECONOMY.

Value of Their Pollination Service.

W. A. GOODACRE, Senior Apiary Instructor.

BEES play a more important part in the national economy than most people realise. Their activities are of value, not only to the beekeeper, but also to the farmer, orchardist and vegetable grower—and thus, indirectly, to the whole community.

In addition to the production of honey—a valuable natural food—and of beeswax —which is used in the manufacture of many articles in everyday use—bees also work for practically all who are engaged in agriculture and in horticulture. This they do by providing a pollination service on which, in many cases, the primary producer depends for the setting of payable crops of fruit, vegetables and seeds of crop plants.

Bees are social insects, and one hive may have a population of up to 50,000. They visit the flowers of plants to obtain their food supplies, consisting of both nectar and pollen. As they do so they become dusted with tiny granules of pollen, some of which are transferred to the stigmas of other blossoms visited, thus effecting pollination and ensuring that the plants produce seed.

Service to Fruit-growers.

For this reason, bees have a particular value to the fruit grower. Practically all commercial varieties of pome and stone fruits are self sterile, and require cross pollination. Bees can provide a very useful service under these conditions because the colonies can be controlled and placed where required. "No bees, no payable crop," is a generally accepted saying. The apiary should be established on a sunny; well-drained site close to the orchard, and reasonably handy to a permanent water supply. This is particularly necessary during changeable weather in spring, a time when most fruit trees come into flower.

Seed Crops of Lucerne and Vegetables.

The pollination of the lucerne flower by bees is an example of the service rendered in seed crop production. The flowers of lucerne need to be "tripped" to effect fer-

tilisation, and this "tripping" process is often effected by the bee when it enters the flower in search of nectar. The weight of the bee and the pressure exerted release the stigma and stamens. The hairs on the thorax of the bee become dusted with pollen, and when the bee visits other lucerne flowers, causing a similar action on the part of these flowers, the pollen previously collected is transferred, effecting crop fertilisation and resulting in an increase in the amount of seed set.

The valuable service produced by bees in pollinating certain species of vegetable plants was shown when an officer of the Department was sent to Lord Howe Island to investigate difficulties being experienced by vegetable growers. He found that growers on the island were forced to pollinate pumpkins and some other species by hand, because of the absence of bees. Colonies were sent as soon as possible; in fact, several consignments of bees have been sent over since then.

The householder who has a small garden in the back yard, has an interest in the activities of bees. The plants provide every attraction and convenience for bees to work the flowers to ensure that the required pollination service will be complete. Take the Iceland poppy as an instance. It will be observed that the bud is turned downwards, and just prior to flowering, the stalk straightens up and almost invariably the flower faces the sun. Thus we have the attractive flower, the petals providing a convenient foothold for the bees, and facing the sun so that the bees can work in comfort. Poppies often flower during the winter or early spring and would be difficult for bees to work on if they were in the shade. Cool conditions have a tendency to cramp the bees' legs.

Research Into Bee Pollination.

In countries like the United States of America, and Russia, where intensive systems of agriculture are practised, a good deal of scientific investigation is being carried on with a view of improving pollination—and particular attention is being devoted to honey bees as they are especially adapted by nature for the work, and can be controlled and placed where required. In the United States recently, the Farmers' Union made a special request for a grant of two hundred and fifty thousand dollars for further experiment work to endeavour to overcome the drop in the average production of seed from lucerne, clovers and other plants.

Reference was made in last month's Notes to the work in Russia in training bees to work on lucerne flowers to increase production of seed.

Co-operative Use of Bees by Growers.

A very interesting move is being made in the United States by a fruit growers' co-operative society to assist its members in securing an adequate pollination service. Instead of each member securing hives of bees for his own needs—a method fraught with many difficulties, not only in obtaining the bees but in the proper care and management of them—the society makes arrangements to hire the required number of hives and pays a beekeeper to care for them during flowering of the fruit trees. With this plan all members share in the expense, and it certainly appears to be worthwhile.

It is not uncommon for an orchardist or farmer in New South Wales to make available a specially selected site for an apiary to be established on his property. Those mainly interested are apple, lucerne and prune growers. However, it is hoped that some planned scheme will be developed in the future. The main work of pollination is completed before spraying commences, and with an organised scheme, arrangements could be made to remove the bees before the spraying was commenced, thus avoiding danger to the bees.

Beekeeping in Australia, and particularly in this State, has made considerable progress during recent years, and as a result of a better understanding of the value of the industry in the national economy, it is receiving more encouragement. It can be assisted to make further progress by prevention of the indiscriminate destruction of what remains of our native trees—Eucalypts and other species. This destruction has already gone too far—with serious effects on our useful bird and insects and its contribution to the great problem of soil erosion.

Water Purification of Beeswax

Causes of Frothy Scum.

WHEN beeswax is rendered by the hot water process a frothy, waxy scum forms below the wax and adheres to the bottom of the wax cake on cooling—and sometimes causes considerable waste.

Experiments carried out by Mr. A. V. Robinson, Senior Chemist of the Department, have shown that the character and amount of the scum are governed by a number of factors, including the amount and type of impurities present in the wax, the amount of boiling given during the rendering process and the purity of the water used.

Water purification of wax is the method used by small producers. Large scale producers who use some method of heating for dealing with cappings, from which the bulk of beeswax is produced, do not experience this trouble except when dealing with cull brood combs, with which water extraction must be practised.

The usual water rendering or purification method consists of placing cull combs, or pieces of wax which need refining, in kerosene tins of hot water, standing over a fire. The water is brought to boiling point, and the wax, on melting, forms a heavy floating layer through which the froth and impurities are unable to penetrate. They, therefore, accumulate below the melted wax and, on cooling, give rise to a dirty, crumbly, waxy layer which adheres to the bottom of the wax cake. This layer may be only thin, or may constitute a large part of the wax cake. A typical inferior sample was found to consist of approximately 42 per cent. (by volume) of air and 58 per cent. (by volume) of wax, dirt, etc., indicating that it is a stabilised froth.

The formation of scum is generally worse when working with lower grade wax containing various impurities. Care in production of the wax, and where possible, the separation of poor wax from good when rendering, will assist in obtaining maximum yields of wax free from frothy material.

Experiments with distilled and tap waters indicate that, other factors being equal, the better the water used, the smaller the amount of waste matter likely to be formed. Where possible, rain water, collected in tanks, should be used for the work. In some cases the addition of a small amount of white vinegar or acetic acid to the water has been found to assist in reducing the amount of waste matter formed on the bottom of the wax. Other acids have also been used, but in general the use of acids is not desirable as it may introduce manufacturing difficulties. The following procedure should be adopted to eliminate or reduce this defect to a minimum:—

1. Where practicable, use rendering methods other than heating the wax with water.

2. If water rendering must be used, use water of best quality, such as galvanised tank-stored rain water.

3. If sufficient wax is available, grade the wax, before rendering, into classes, so that poor quality wax will not reduce the value of wax of better quality.

4. When heating with water, endeavour to keep the water temperature as high as possible without too much boiling—thereby reducing foam formation to a minimum. For the same reason, the injection of live steam into the rendering tanks is not considered to be a generally desirable practice, unless particular care is taken, otherwise foam production will be greatly aggravated.

Butchers' Obligations Under Swine Compensation Act.

ALTHOUGH during the war years the slaughter of pigs for pork was prohibited, and in consequence the operations of the Swine Compensation Act fell into disuse in some country districts, the Act was never suspended. It is therefore still necessary for all country butchers who may kill pigs to maintain and keep up to date the register as required by the Act.—*Division of Animal Industry.*

JETTING SHEEP TO CONTROL BLOWFLY INFESTATION.

The Advantages of a Systematic Programme.

DETAILS OF EQUIPMENT AND OPERATION.

(*Continued from vol.* 58, *page* 593.)

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Entomologist.

THE first instalment of this article, which appeared in November, 1946, dealt with the value of a systematic jetting programme in the control of sheep blowfly infestation, indicated the comparisons which sheep men should make between this and alternative methods, and described some of the equipment required, including the single-sheep raised race.

In this continuation detailed plans and specifications of the "Tononga" type race are given for the benefit of those who may desire to construct such a race, together with recommendations for the management of single-sheep raised races. The author also discusses jetting in floored branding races.

Management of Single-sheep Races.

The following are hints on the construction and management of single-sheep raised jetting races:—

1. The entrance ramp and box must be of such a width that sheep can hardly attempt to turn. This necessitates the movable off-side wall or a false wall to be put in for young sheep.

2. Provide the floor with such grips for the feet of the sheep that they can walk on wet boards with confidence.

3. Keep jetted sheep in view from the exit door of the race—this will reduce any tendency towards hesitancy to leave the box.

4. Arrange a wide, level walk-out from the box. The exit ramp shown in the plans is a compromise for portability. In a stationary race it could be bigger.

5. A "Dewar step" before the entrance ramp prevents sheep from backing out of the ramp, and thereby keeps the ramp full and generally keeps up the pace of jetting. However, when sheep are running well it is advantageous to have the step movable so that it can be discarded.

6. It is advisable to avoid facing the exit to the east or the west, because the low sun in the morning or evening, reflected from wet boards, may dazzle the sheep and make them reluctant to walk out.

7. The walls of the entrance ramp and jetting box shown in the plans are of iron. It is advantageous to have the near side wall of the forcing pen filled in so that the sheep do not see the jetter. A forcing pen with the side walls 18 feet long and 9 feet wide at the back gate is very good, but sheep can be worked into the box very well from a 30 feet by 3 feet drenching race.

Specifications of the "Tononga" Type Single-sheep Race.

Materials Required:—

The materials used in making the model illustrated cost less than £7 in Moree in January, 1939. They were—

- Hardwood: 3in. x 2in., 92 running feet; 3in. x 1in., 408 running feet.
- Carriage bolts: ⅜in. x 5½in., 4 bolts; ⅜in. x 4½in., 44 bolts; ⅜in. x 3½in., 6 bolts; ¼in. x 3¼in., 8 bolts; ¼in. x 2¼in., 116 bolts; ¼in. x 1¾in., 12 bolts.
- Roofing bolts: ¼in. x 1¼in., 125 bolts.
- Plain galvanised iron: 24G., 6ft. x 3ft., 6 sheets.
- Guttering: 24G., 6 feet.
- Hoop iron: 60 feet.
- Two brackets of 1in. x 6in. x ¼in. iron supporting entrance ramp.
- Iron (⅜in.) D on sliding gate.
- Three pulleys and a hank of blind cord.
- Lever of oregon 3in. x 1in., 7ft. 6in.
- 2-inch nails for floor.

The above materials make ramps and central box only. For the step, two 4-feet hurdles beside the step, and four 7-feet hurdles (for exit walk and near side of forcing pen, the latter covered with iron) there will be needed:—

- Hardwood: 3in. x 2in., 3 running feet; 3in. x 1in., 260 running feet.
- Plain galvanised iron: 24G. 6ft. x 3ft., 3 sheets.
- Carriage bolts: 2¼in. x ¼in., 100 bolts.
- Steel posts: about 9.

Hardwood is specified because oregon failed to stand up to transport. The weight of hardwood is compensated for by the great strength of the finished race. The heaviest unit (central box without offside wall) weighs under 200 lb.

The rake must be made and adjusted with care. Its management is described on page 41.

The offside walls of the central box and entrance ramp are movable, allowing the width of the race to be 16 inches, 14 inches or 12½ inches for woolled ewes, shorn ewes and weaners respectively. This is most important.

The Floored Branding Race.

The other broad type of jetting race is the long wide one like a floored branding or drenching race. In this the sheep are packed in, two or three wide, so that they have little room to more, and are then worked through by the operator who may lean over the rail from outside the race or get in with the sheep and work through them.

Advantages of the long race are—

1. It can if necessary be worked by one man, and is therefore indicated for the smallest flock.
2. Two hoses can be used in one race.
3. Though the operator gets splashed, it is not impossible to work without gloves and face screen.

Disadvantages are—

1. The constant stooping and simultaneous man-handling of the sheep as the jet is applied make the job one of hard physical labour. This, combined with the fact that pronounced stooping is required if the crutch wool is to be seen, leads sometimes to inefficient jetting.
2. The long race is not portable.
3. The re-use of waste fluid is more difficult than in the single-sheep raised pen. Drainage has to be more elaborate to give the required fall for the full length of the race.

This type of race is recommended only for the small owner who may have to work alone or who could never be sure of being able to call in a 3-man team for jetting.

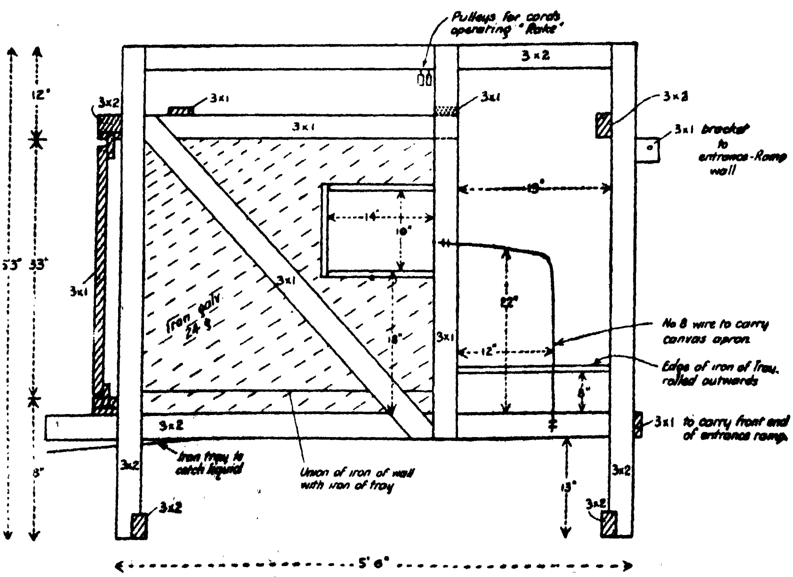
Jetting in one of these ground-level races is likely to be most thorough if the operator is in the race with the sheep, starting behind them and working forward. Each sheep is approached from behind and is so packed in by its neighbours that it can move very little until finished with.

A drawback is that when the race is finished the sheep have all been turned round and time may be lost in emptying. This objection is removed if the entrance and exit to the race are at the one end, with a decoy pen at the far end to lead the sheep in.

To work in the race with the sheep the operator needs rubber thigh boots.

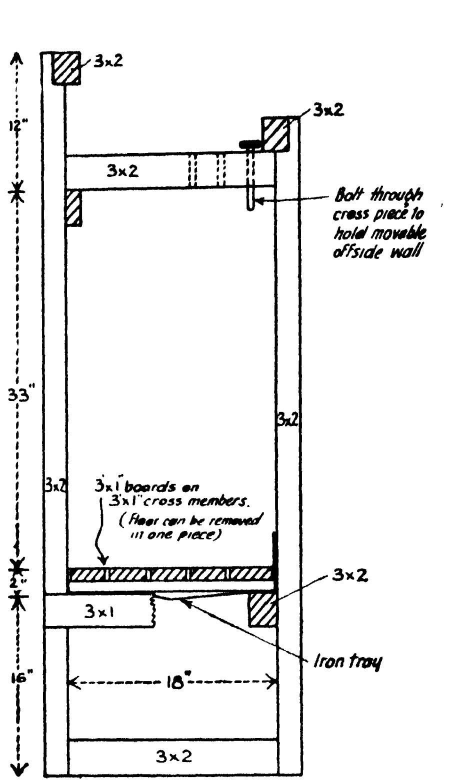
(To be concluded)

Detailed Plans of Portable Single-sheep Raised Type Jetting Race.

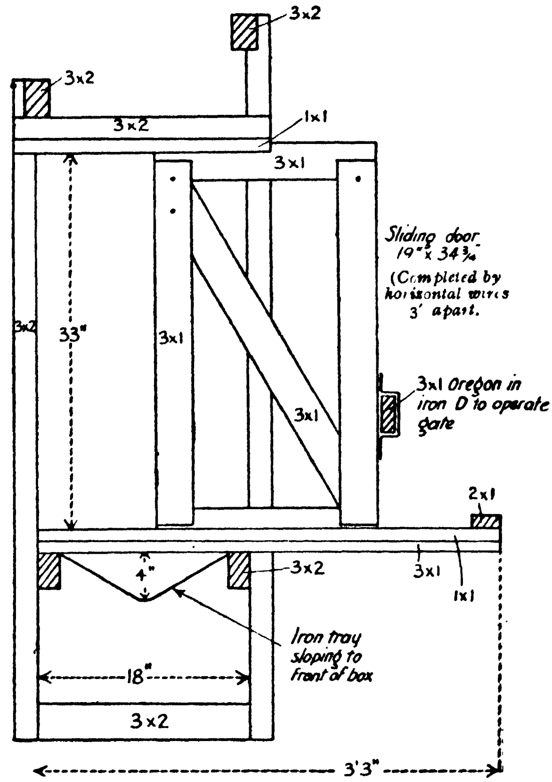


Details of Construction of Left Side of Central "Box."

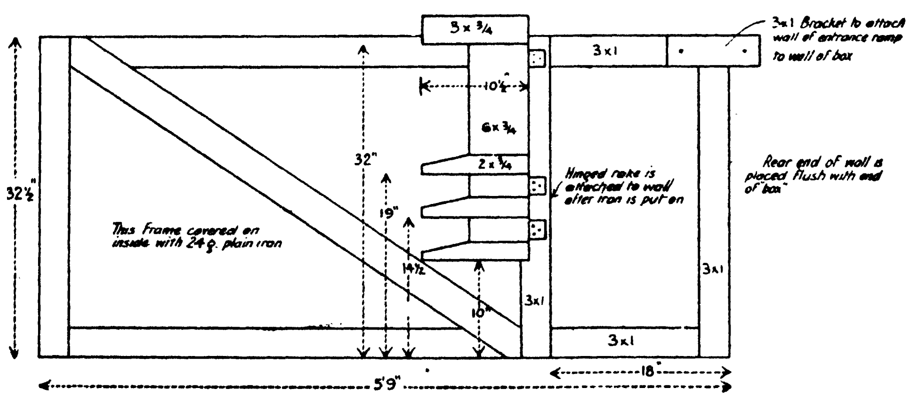
Walls are of 24-gauge galvanised iron bolted on to hardwood frames, with ¼ in. bolts 10 in. apart. Edges of iron covered with hoop iron. Liquid-catching tray under floor is of plain iron (1 sheet) and extends up the outside of walls of "box." In jetting opening it is carried up 6 inches above floor level. The opening in the near-side wall is to allow the sheep to be handled with the left hand, while the right hand and hose pass behind the canvas apron.



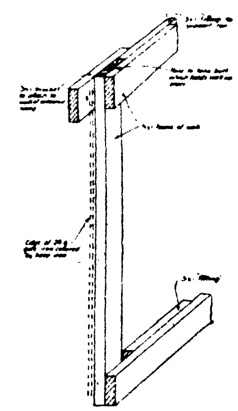
Rear View of Central "Box."



Front View of Central "Box."



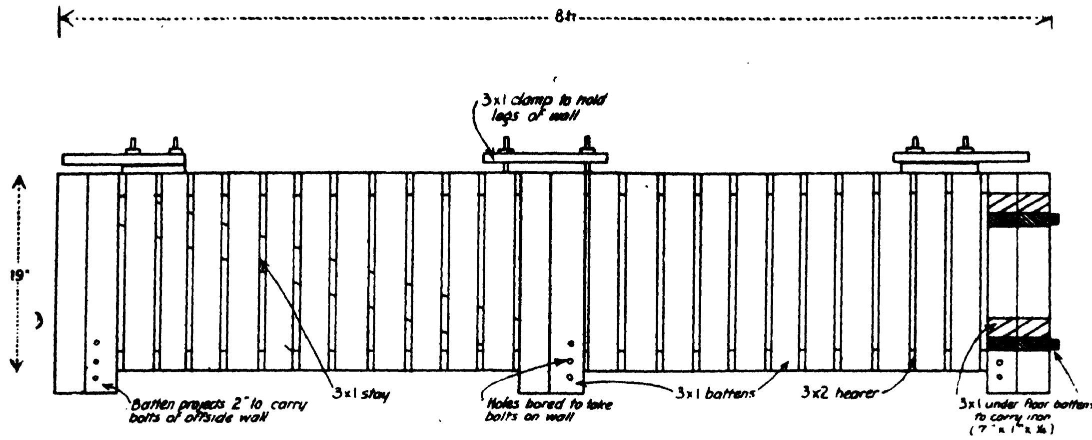
Frame of Moveable Off-side Wall of Central "Box," as Seen from the Inside.



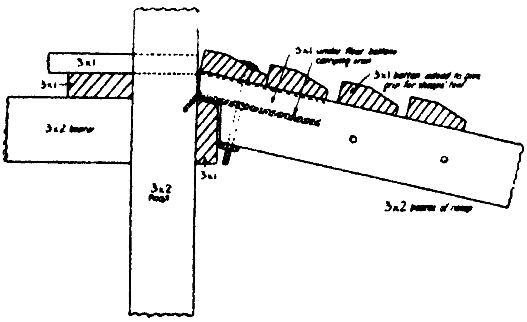
End of Movable Wall.

DIMENSIONS AND POSITIONS OF RAKE ARE IMPORTANT.

THE rake is to prevent sheep from backing out of the jetting position. One cord from the rake passes over two pulleys to the lever operating the sliding door. Another cord passes from the rake over one pulley to a weight near the operator's feet. When the sliding door is opened the rake is pulled back against the off-side wall. When the sliding door is shut the rake is pulled by the weight into the race to the limit of a check chain. The rake should come to within 10 inches of the near side wall. It then holds the sheep, leaving the crutch open for jetting.



The Entrance Ramp Floor.



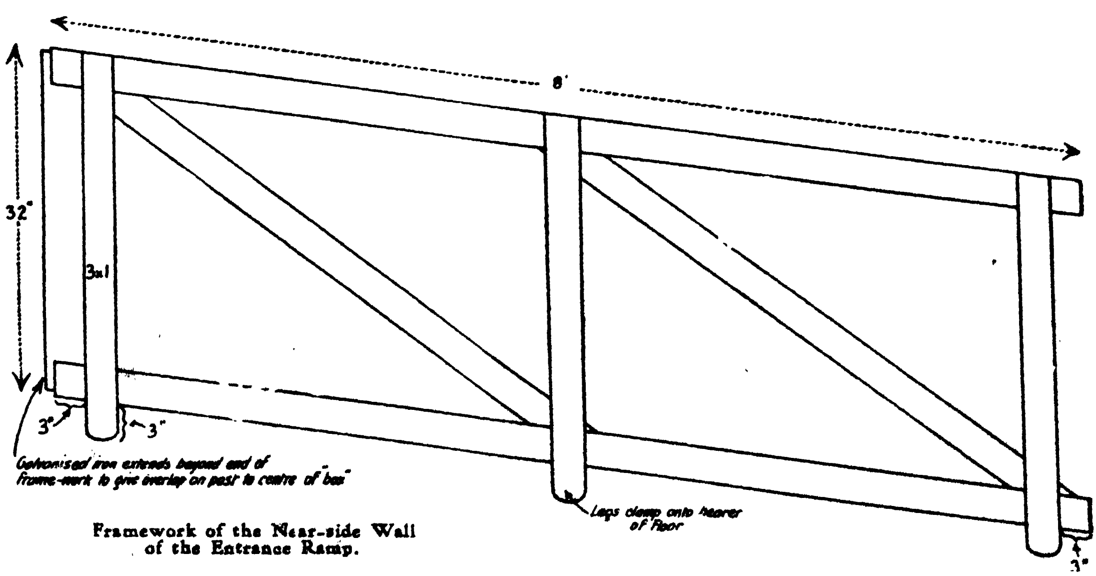
Details Showing Attachment of Entrance Ramp Floor to Central Box.

Wall of Entrance Ramp.

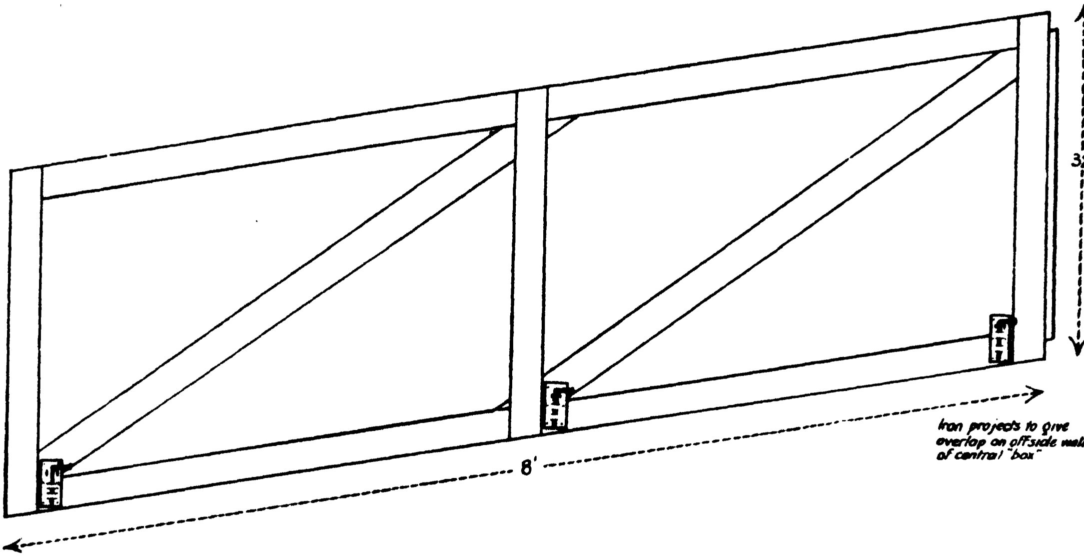
THE drawing immediately below shows the construction of the near side wall of the entrance ramp as viewed from outside the race.

This wall is covered on the inside with 24-gauge plain galvanised iron.

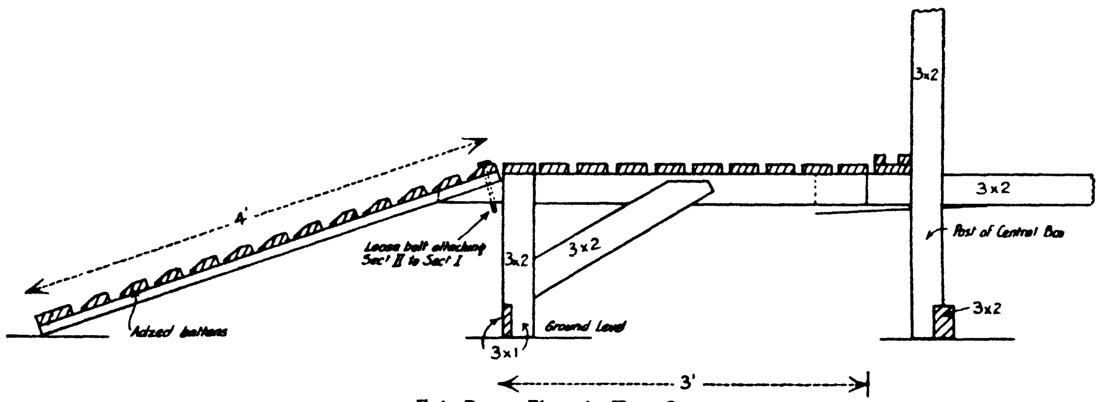
The framework of the offside wall is shown on the next page. It also is covered with iron on the inside. The bolts fit into holes in the ramp floor and hold this removable side in position.



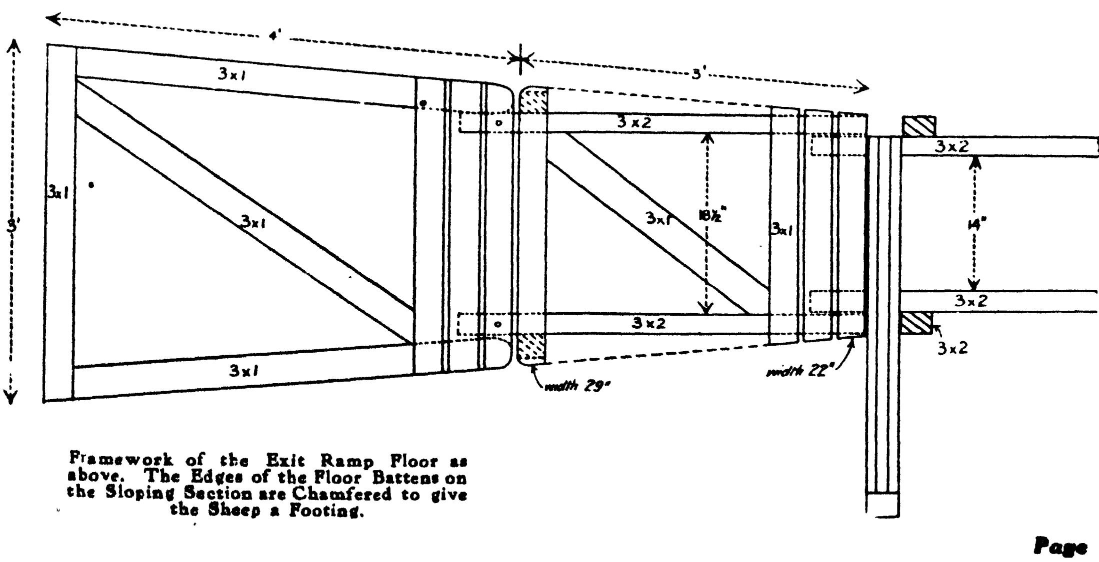
Framework of the Near-side Wall of the Entrance Ramp.



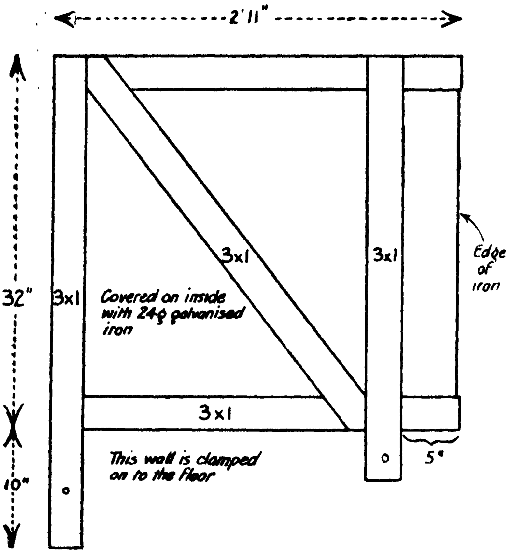
Framework of the Off-side Wall of the Entrance Ramp.
The first section has a built-in iron tray to drain fluid back into the guttering which catches run-off from under the central box.



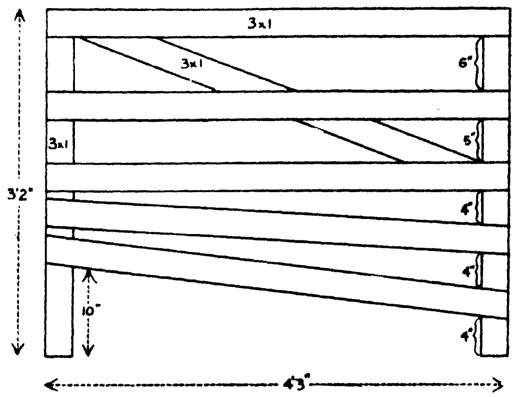
Exit Ramp Floor in Two Sections.



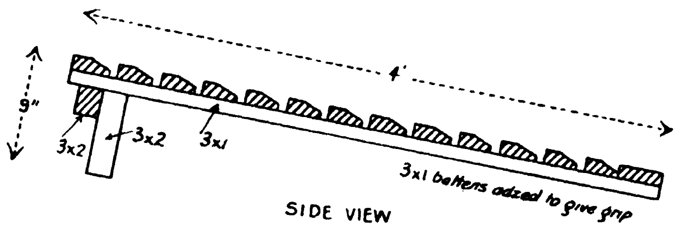
Framework of the Exit Ramp Floor as above. The Edges of the Floor Battens on the Sloping Section are Chamfered to give the Sheep a Footing.



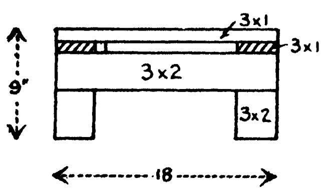
Near-side Wall of Exit Ramp as Seen from Outside the Race.



Framework of the Hurdles which Stand on Both Sides of the "Step" or Short Ramp Shown below. The Hurdles are Held in Position by Steel Posts. The Near-side Hurdle is Covered with Galvanised Iron.

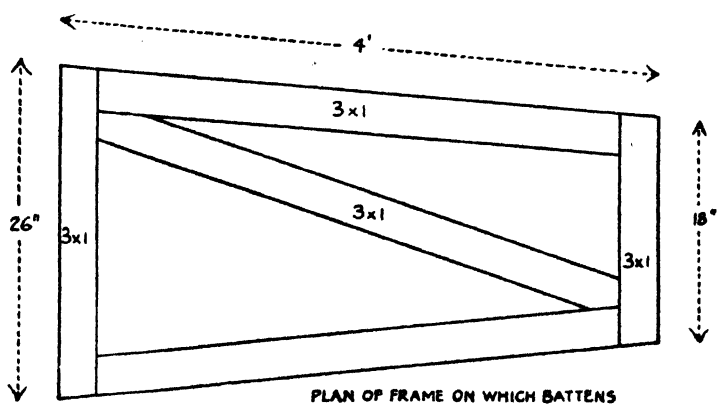


SIDE VIEW



END VIEW

Details of Construction of Short Ramp or "Step" Before the Main Entrance Ramp.



PLAN OF FRAME ON WHICH BATTENS ARE NAILED

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

BUTTER-FAT TEST AND FEEDING.

Importance of Roughage.

ALTHOUGH cattle can be fed entirely on concentrates, without any roughage, they usually do not thrive under these conditions; their appetites are capricious, rumination is suppressed and milk production is usually affected. On these grounds it has always been recommended when feeding concentrates and where there is little or no grazing, that a certain amount of roughage such as hay, chaff or silage, be fed—with a minimum of, say, 8 to 10 lb. of hay or chaff, or 30 lb. of silage or green fodder per cow per day. However, overseas observations, supported by recent observations and experiments by this Department, have indicated that roughage is not only of importance in maintaining normal digestion, but in maintaining the butter-fat content of milk.

Effect of Poor Roughage Intake.

The important facts emerging from these investigations are:—

1. *Amount of Roughage.*—Even as much as 6 lb. of hay per cow per day, when feeding concentrates, will not provide enough roughage to maintain the butter-fat percentage. With this low roughage intake, butter-fat of a herd may fall from say 3.5 per cent. to as low as 2 per cent. Probably at least 8 or 10 lb. of hay or chaff, or its equivalent in dry matter (about 30 lb. of silage or green fodder) is necessary to maintain a normal butter-fat level in milk.

2. *Condition of the Roughage.*—The state in which the roughage is fed is important. Feeding a finely ground roughage, even as much as 20 lb. per day, will not maintain normal butter-fat content. Finely cut chaff may have the same effect.

3. *Influence on Milk Production and Health.*—With insufficient roughage, or roughage in an unsuitable form, the butter-fat may fall, as indicated, from, say, 3.5 per cent. to 2 per cent. in a very few days, and may remain at this low level, with no apparent effect on the health of the cattle or on the quantity of milk produced until the roughage part of the ration is improved. Cattle have maintained production on such rations and produced low fat content milk for as long as two lactations, and have then produced milk with a normal butter-fat content as soon as the roughage was increased or fed unground.

In the cases investigated in this State by officers of the Divisions of Animal Industry and Dairying, butter-fat had fallen so low (to between 2 and 3 per cent.) that the milk was being rejected by the factories, and dairymen were even separating as much as half of their milk, and adding the cream to the rest of the milk in order to pass the factory test. Investigations showed heavy concentrate feeding and low roughage intake, due to either poor quality grazing or extremely limited amounts of chaff or silage being fed.

The amount of roughage in most cases was equivalent to less than 6 lb. of hay per day. As soon as the roughage was increased, butter-fat tests returned to normal.

The Matter of Cost.

On the ground of economy in feeding costs, low roughage rations are advisable when feeding on bought feed, as food units in hay or chaff bought at, say, £10 per ton, cost about 3d., and in concentrates at average prices only about 1d. to 1½d. The ideal, in view of the high cost of food units in roughage, is to provide as much as

possible of the food requirements by the cheaper food units in concentrates, and to feed only limited amounts of the roughage; but care must be taken that the roughage ration is not too severely restricted, as otherwise the butter-fat percentage of the milk will be seriously decreased, resulting in either the whole milk being rejected at the factory or, if the milk is being separated, seriously decreased butter-fat production.

Where there is no grazing, or only limited grazing, a minimum of 10 lb. of hay or chaff (or 30 lb. of silage or green fodder) per cow per day should be aimed at. Of course, smaller breeds such as Jerseys could possibly do with less, and larger breeds, such as Friesians may need more.

When Grazing Oats.

Other observations indicate that grazing on oat crops may lead to a fall in butter-fat content of milk. These observations are probably related to the quantity and quality of the roughage, so that if trouble is being experienced with butter-fat content when grazing oats, it may be advisable to feed some coarse dry roughage such as hay, chaff or straw, either in the bails or while the cattle are in the paddock.

Infertility in Sheep on Subterranean Clover.

Pasture Management as Means of Control.

A RECENT statement by the Western Australian Department of Agriculture describing further investigations concerning the detrimental effect observed on the reproductive processes of sheep heavily grazed on Dwalganup (early strain) Subterranean clover, shows that there is now strong evidence that a measure of control can be obtained by appropriate management.

Feeding tests have shown that during the period between germination and maturity of the clover there is a high intake of the substance apparently responsible for the various reproductive disturbances, but that from about the hay cutting stage the herbage is relatively harmless. So far no samples of meadow hay tested have given evidence of potency; and although the burr, particularly the husk, is highly potent, the results of examination of the sex organs of wethers indicates that under ordinary conditions the proportion of burr consumed by sheep on dry pasture is not sufficiently high to produce any harmful effects.

Avoid Continuous High Intake.

"The principle underlying management," it is stated, " should be avoidance of a continuous high intake of clover for breeding ewes except during the 'safe' period from maturity to the end of the dry stage. It has been shown that the harmful effects resulting from clover grazing may be demonstrated in ewes at the early age of twelve to fourteen months. Further, once changes have been induced in the uterus they may affect the subsequent breeding capacity of the ewe, probably permanently. This long-range effect has been repeatedly demonstrated. It is not profitable to attempt to breed from ewes which have been affected with dystocia [difficult parturition] or have been shown to be infertile even if they are subsequently denied all access to clover.

"It would appear probable that ewes during the later stages of pregnancy could be particularly susceptible to the effects of grazing on potent green clover.

"The most practicable method of avoiding an excessive intake of clover, under West Australian conditions, would appear to be the balancing of the dominant clover pastures with cereal oats and Wimmera rye grass. Such herbage is greatly preferred by sheep during the dangerous stages of growth of the clover. There is some experimental evidence, not yet complete, and a considerable body of field experience that the measures indicated can be expected to minimise the occurrence of the breeding problem in ewes when such ewes have not already been affected by previous treatment."

Influence of Phosphate Fertiliser.

Experiments are being carried out to determine whether the production of the potent substance is a normal characteristic of Subterranean clover or whether it is an abnormality resulting from some unfavourable factor in the environment, such as a specific mineral deficiency in the soil.

As the development of the problem and its extension in Western Australia coincided with the period when, due to war conditions, it was necessary to curtail superphosphate dressings, it is suggested that, pending experimental evidence on this point, every effort should be made to raise the phosphate status of the soil with full dressings of superphosphate.

Position in New South Wales.

While the statement refers to the Dwalganup strain of clover grown under Western Australian conditions, it is pointed out that there is evidence from the other States that other strains of Subterranean clover may give rise to the same breeding problem. That the disease is making its appearance in New South Wales, on pastures predominantly Subterranean clover, was recently drawn attention to by Mr. Max Henry, Chief of the Division of Animal Industry.

Fig. 1.—Poultry Houses on the Headlands of the Citrus Orchard of Mr. P. G. Wrench, Kenthurst.

POULTRY NOTES.

Housing and Management of Poultry In the Orchard.

V. H. BRANN, Poultry Instructor.

MANY citrus growers have, in recent years, successfully combined poultry farming with their fruit growing operations. The advantages of such a combination are: more efficient weed control resulting in better retention of moisture; lower cultivation costs since this operation is largely eliminated; soil erosion losses are reduced; and a useful supplementary supply of manure is provided.

The system is not without disadvantages which must be carefully considered. The chief of these are that the poultry constitute a definite tie, since they cannot be left unattended for even short periods, and this may interfere with the orchard management; and that scale pests tend to increase and must be given special attention.

In this article Mr. Brann sets out the methods of management and the types of houses that are necessary to ensure success in such a venture.

Having decided that conditions are suitable for running poultry in the orchard, the first consideration is the planning of the pens and general management of the birds. Generally speaking, conditions in an orchard are such that the development of young birds and egg production should be better than on the average commercial poultry farm, if the same attention is given to management. With judicious planning the risk of worm infestation and infection with the more common diseases would be small. Spacing the houses a considerable distance apart and housing a small number of birds in each house, which are essentials of this system, create favourable conditions for the health of the stock. However, they increase the distance travelled in attending to the birds, which is the most serious drawback to a combination of poultry raising and fruit growing, and for this reason, all practicable labour-saving devices should be adopted, particularly with regard to feeding and watering.

Lay-out of Poultry Buildings and Runs.

In most cases it will be found most satisfactory to place the pens for raising the young stock up to about 10-12 weeks of age (when they should all be roosting)

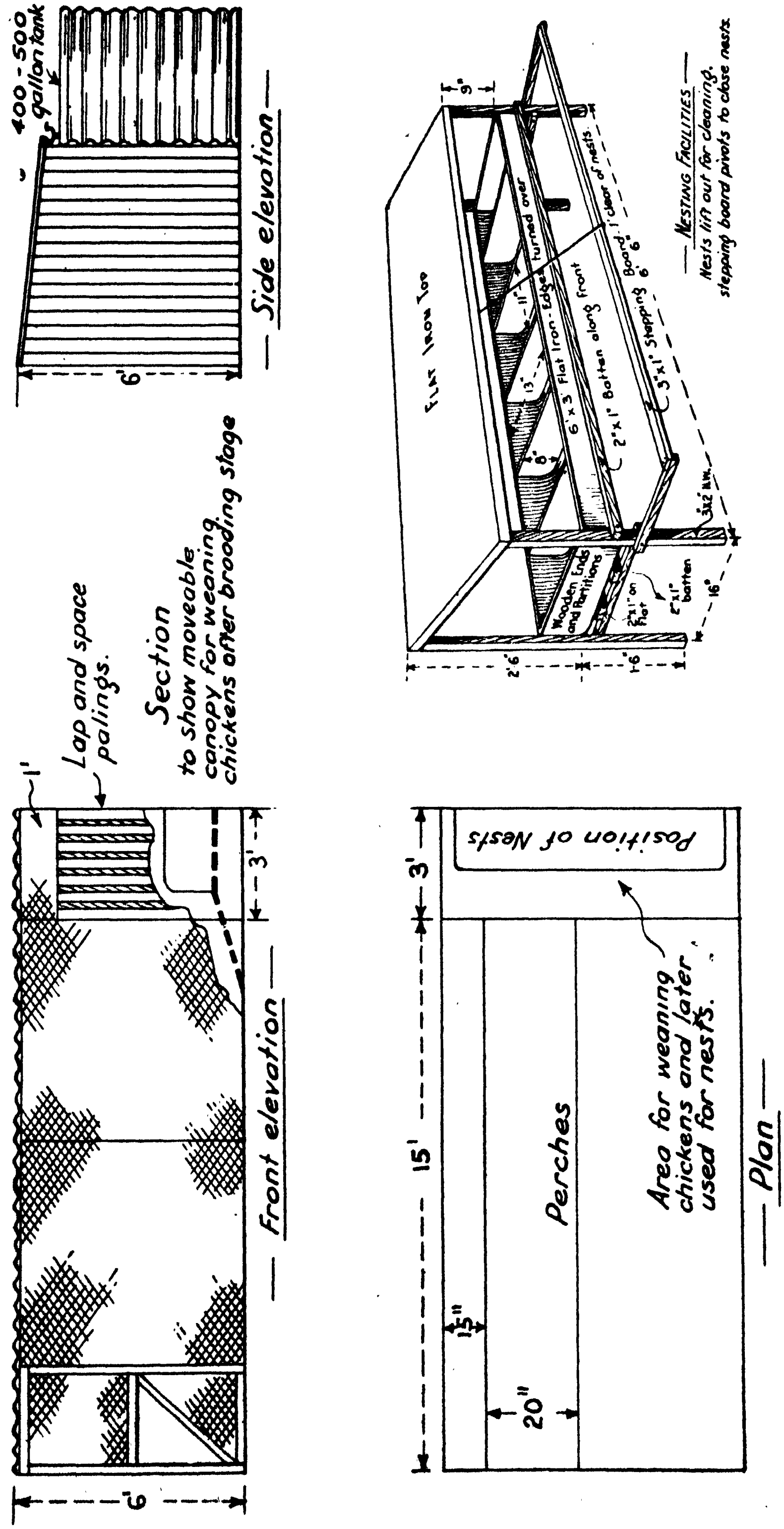


Fig. 2. -Sketches of Self-contained Poultry House, for use in An Orchard.
Suitable for fifty layers

near the residence, but if conditions permit of giving the proper attention to younger birds they can be transferred to the orchard at 6 weeks of age and taught to roost—but it should be understood that this involves closer attention than would be necessary with chickens which have learnt to roost before being placed in the orchard.

The subdivision of the orchard into a number of runs is not desirable, or necessary, if the houses are spaced sufficiently far apart to prevent the birds drifting from one house to another. The houses should not be less than 2 chains apart.

It is desirable to have a small run, made with portable frames which can be moved from house to house, to confine the birds when they are first placed in the orchard. The birds should be kept enclosed in these runs for at least a week to accustom them to the new locality, and the houses should be so constructed that the birds can be shut in at night after the runs are removed, to protect them against foxes or to facilitate culling when necessary.

Figure 2 shows sketches of a self-contained house suitable to accommodate fifty layers. The house is designed so that the chickens can be transferred from the orchard when 6 weeks old if desired, and allowed to remain until they are culled for market at the end of their profitable life. If chickens are transferred from the brooders at 6 weeks of age, a roosting ramp (as illustrated in Fig. 4) can be fitted in the enclosed end of the house to teach the chickens to roost, and when they are all roosting, the ramp can be removed and the space utilised later for the nests as indicated.

Suitable nests (in groups of six) for use in these houses can be made from a sheet of 6 feet by 3 feet flat iron and case ends. Each nest will be 13 inches by 11 inches wide by 8 inches deep. For cleaning the group of six nests can be removed from the framework, the details of which are shown in Fig. 2.

These houses should have a concrete floor to facilitate cleaning and to keep the houses dry. Where the water supply cannot be reticulated in pipes from a central supply, it is advisable to have a 400-500 gallon tank at each house to catch the water and to connect a ballcock system to the tank in order to provide a constant supply of water. The approximate quantity of water required by fifty birds in the summer is 3 to 4 gallons per day, in addition to water used for flushing out the troughs.

Figs. 1 and 3 show suitable positions for the houses on the boundary of an orchard.

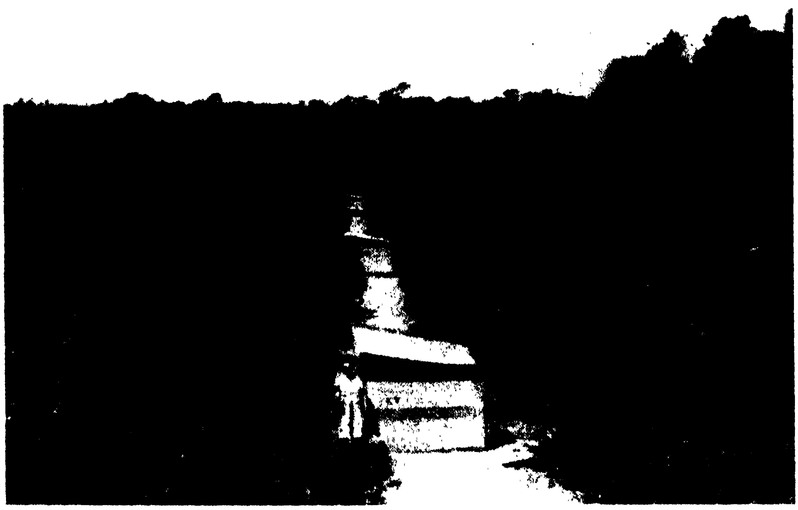


Fig. 3.—Poultry Houses Placed in a Row Across the Centre of a Citrus Orchard.

Rearing Chickens.

The most economical method of stocking and maintaining a flock of birds in an orchard is to purchase day-old pullets and raise them in suitable brooders. Many different types of brooders can be used for raising the chickens up to 6 weeks of age, but where a reliable supply of electric current is available, electric hover brooders will be found labour-saving and efficient.

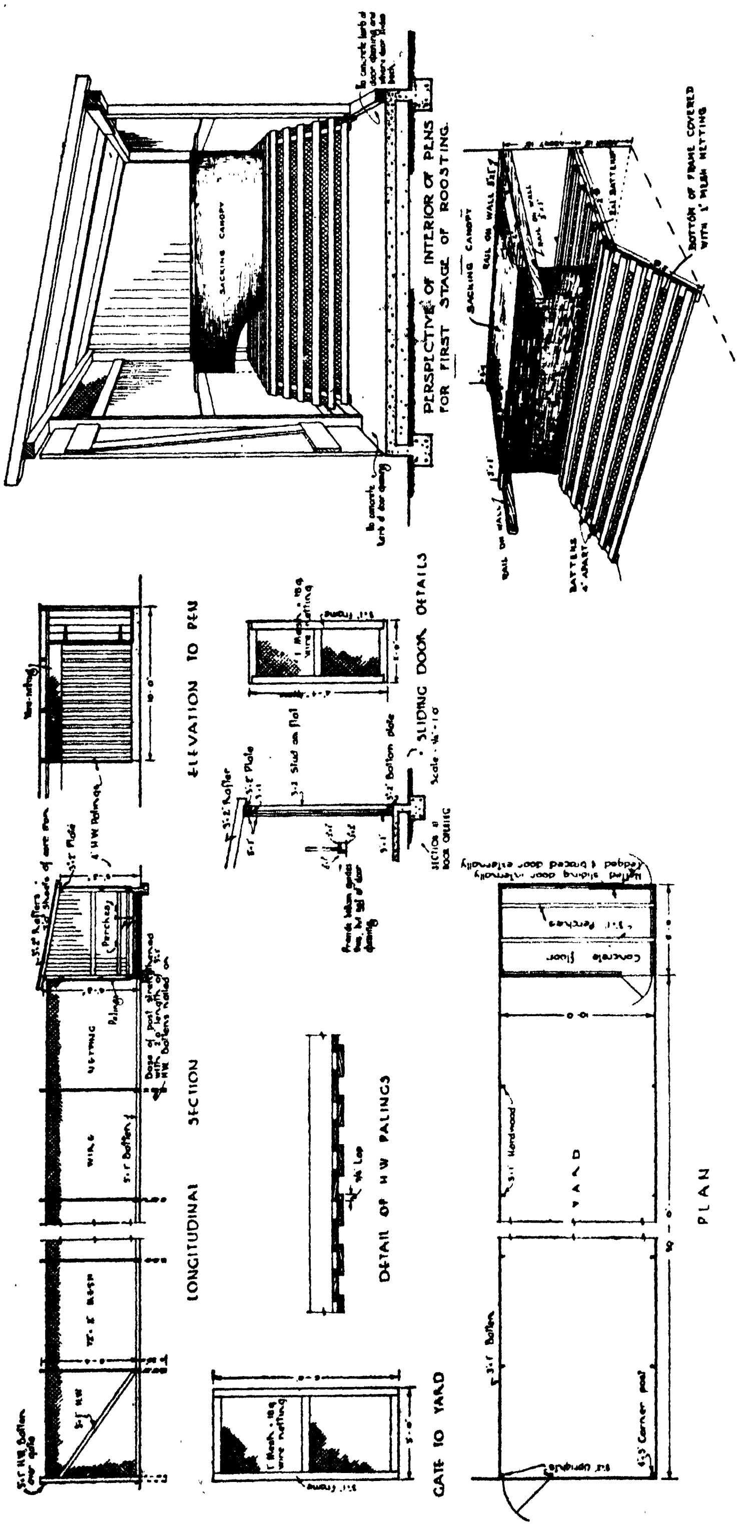


Fig. 4.—Details of Construction of Continuous House Type of Weaning Pens.

A suitable brooder house is essential with any type of brooder and for most brooders, a house 14 to 15 feet wide, 7 feet high at the back and 9 feet high in front is desirable. The length, of course, would be governed by the number of brooders to be installed, but as a guide it can be laid down that approximately 72 square feet of floor space should be allowed for each 100 chickens to be reared to 6 weeks of age.

The main factors to be considered in the selection of a brooder unit are as under:—

(1) The brooder should be capable of generating sufficient heat, even in the coldest weather, to prevent the chickens from crowding together, and at the same time provide ample ventilation to maintain pure air in and around the brooder.

(2) There should be no obstruction of any kind to prevent the free movement of the chickens to and from the heating unit if they wish to move to a cooler zone, should the temperature at any time become excessive.

(3) The brooder house should have windows fitted both front and back to provide ample light and ventilation to the room. The windows should be spaced about 8 to 10 feet apart, and should preferably be pivoted so that ventilation can be adjusted.

Several types of kerosene lamp-heated brooders can also be obtained for raising chickens up to 6 weeks of age, and these can be installed in a shed as described above, but the lamps require daily attention; the burners must be cleaned to avoid smoking, and the containers must be filled with oil.

Second Stage of Rearing.

If the chickens are to be raised to the roosting stage before being placed in the orchard, it is necessary to provide cosy houses for this purpose, and a suitable type of house and run is illustrated in Fig. 4.

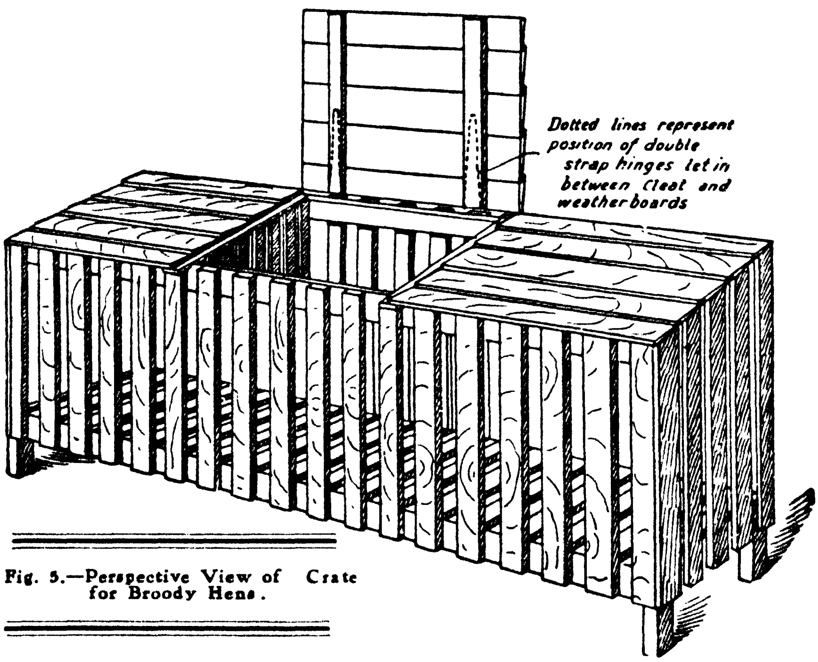


Fig. 5.—Perspective View of Crate for Broody Hens.

Each compartment of such houses will accommodate 60-75 chickens from 6 weeks of age until they have learnt to roost, and if these pens are placed in reasonably close proximity to the dwelling, they can be readily attended to at any time necessary with a minimum of labour.

Movable Houses or Arks.

In some cases the use of movable houses in an orchard may be justified, but under most conditions it will be found that the permanent houses are more satisfactory and have a longer life than those which are moved from time to time. Those interested in the use of portable houses should apply to the Department for further information.

Semi-Intensive Houses.

Under orchard conditions the usual type of semi-intensive house would not be as satisfactory as a smaller roosting house of the type described previously. The semi-intensive houses used on commercial poultry farms are designed to accommodate any number from 100 to 200 birds or even more, in some cases, and to have such numbers concentrated in one area of orchard would detrimentally affect the trees.

Suitable Breeds.

Although the White Leghorn predominates on commercial poultry farms, this breed is not as satisfactory for orchard conditions as heavy breeds—Australorps, Langshans or Rhode Island Reds—or a cross between Leghorns and these heavy breeds. The reason for this is that the Leghorns will roost in the trees instead of in houses and cause damage to the trees. One of the most popular crosses is the White Leghorn male mated to Australorp hens. This cross produces a bird almost pure white with white legs and somewhat better for table purposes than the reverse cross. It is also probable that there would be less broodiness in birds of this cross than when the Australorp male is crossed with the White Leghorn hens.

It should be understood that broodiness is a factor which has to be taken into consideration in any heavy breed or a cross with heavy breeds, and unless provision is made for the systematic handling of broody hens they will accumulate in the nests during the spring and summer months. This will cause considerable loss of production and harbour vermin. Thus it is necessary to have a crate as illustrated is Fig. 5. This crate should be divided into three compartments and each night's "broodies" should be placed in a separate compartment; on the fourth night the first lot can be released. If the broodies are not caught each night they will remain broody longer and upset the routine. In most cases it would be possible to have one crate for each two houses, but this would depend upon the number of birds in the house and the size of the crate. Usually, however, a compartment about 3 feet long by 2 feet wide and 2 feet high would be sufficient to take care of one night's broodies from a flock of 100 birds.

Feeding Chickens.

Chickens can either be fed on dry mash with an afternoon feed of kibbled grain or chicken mixture, or on a wet mash. The main consideration when feeding dry mash is to have a suitable hopper which does not permit of waste and which can be closed at night to prevent access by rats and mice. Where wet mash is fed, it is necessary to give four to five feeds per day of mash and one of kibbled grain during the first six weeks; under orchard conditions this may not be practicable unless the chickens are attended to by someone who is not engaged on orchard work.

A leaflet giving full information on feeding is obtainable free from the Department.

Feeding Adult Birds.

There are several different systems of feeding laying stock. The main factors to consider in the choice of a ration are:—

(1) Palatability.

(2) Comparative cost of feeds used.

(3) Minimum use of labour in feeding.

If the chickens are raised on dry mash, there would be little objection to continuing this system throughout the lives of the birds, as less labour would be involved in feeding and although there may be some reduction in egg production during the autumn months, the saving in labour should compensate for this loss.

Another method which might be adopted when the prices of cereals are comparable or lower than those of mill offals, is to feed wheat in one hopper and meat meal or a mixture of protein meals in another hopper always available to the birds. The mixture of concentrates could consist of meat meal 65 lb.; peanut meal 28 lb.; linseed meal 5 lb.; salt 2 lb.—or 98 lb. meat meal with 2 lb. salt would be satisfactory.

As in the case of dry mash feeding, the grain and meat meal should be placed in hoppers which have a closing device so that they can be closed at night to keep out rats and mice.

Experiments carried out by the Department in feeding wheat and meat meal in separate hoppers indicate that production is equal to other methods during the main part of the year, but somewhat less in the autumn and early winter months.

Maintaining a Flock of Layers.

It will be found that the most satisfactory method of maintaining a flock of layers is to replace somewhat over half each year; for instance, in the case of a flock of 1,000 layers it is necessary to raise about 600 pullets each year. This will allow for keeping the laying hens for two seasons and then marketing them as they finish their second flush season of laying.

If possible, the young stock should be raised in a separate portion of the orchard to the older birds and the houses should be spelled for a month or so each year before placing the new pullets in them.

Raising Cockerels.

When the poultry feed position permits of raising cockerels, it would be possible to undertake rearing market birds in the orchard in districts where transport facilities are such as to enable birds to be placed on the market in prime condition and at a reasonable cost.

The main disadvantages of running cockerels in the orchard are that it would not be possible to maintain regular numbers and keep them in the orchard long enough to ensure proper control of the weed growth. Another aspect is that owing to the quarrelsome nature of cockerels over 3 to 4 months of age, a good deal of trouble would be experienced through the weaker ones being bullied by the others, and unless the birds were kept until over 3 months of age they would not be in the orchard long enough at the end of the season to effect weed control.

On the other hand the pens would not be occupied throughout the year and could be thoroughly spelled between seasons, thus ensuring good rearing conditions. Day-old cockerels could be obtained from about May to September, but those hatched after the end of August would take longer to reach a prime marketable age than those hatched earlier, and some of them would not be ready for market before the end of March. Birds hatched up to the end of July could be sold on the Christmas market and should realise better prices than those sold later.

The same types of houses as illustrated for the pullets could be utilised for raising cockerels, but where different ages are running in the same area of orchard, it would be necessary either to divide them with wire netting fences or space the houses much further apart.

Spread of Poisonous Mint Weed Feared.

MINT weed seed has been found in Japanese millet, sorghum and Sudan grass seed brought into New South Wales from other States. Growers purchased substantial quantities of these fodder crop seeds from other States and it is feared that unless every care is exercised by landholders to sow only clean seed, mint weed will spread extensively this season in areas where summer fodder crops are sown.

Mint weed is a proclaimed noxious plant throughout New South Wales, although at the present time infestation is confined mainly to north-western districts. It is feared, however, that unless special precautions are taken, it will be spread extensively in many districts where summer fodder crops are planted.

The Department is arranging for sampling of consignments as they enter the State with a view to ensuring that only clean seed is retailed to farmers. Agricultural instructors have been requested also to obtain samples of summer fodder crop seed from merchants in country districts for testing in the Department's Seed Testing Laboratory.

It is an offence to sell seed which contains mint weed seeds, and merchants are urged in their own interests as well as in those of the farming community to have all doubtful samples tested for the presence of mint weed seed. The Department's seed testing laboratory is prepared to test samples of sorghum, Sudan grass or Japanese millet seed submitted and advise whether they are suitable for sowing.

Mint weed seed has a dull smooth surface and is a fawn to cream colour, about one-tenth inch long and about one-twentieth inch wide. On one side the seed is convex and on the other side it tapers to a central ridge. In summer-fodder-crop seed which has not been thoroughly machine cleaned it might be present as a clean seed without any husk, or it might be contained in a small green or straw-coloured bell-shaped capsule.

Mint weed is an annual plant which spreads quickly under suitable conditions. It has been shown to be poisonous, particularly in the case of hungry stock brought on to mint weed infested country.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., "Elwatan," Castle Hill (Jerseys) ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hann, O., "Bomerah," Barrington (Jerseys)	55
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., "Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	135
Robertson, S. H., "Turanville," Scone	90
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	24
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. A., "Heathfield," Boorowa ...	23	18/12/46
Berry Training Farm, Berry (A.I.S.) ...	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys) ...	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys) ...	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys) ...	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys) ...	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto ...	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys) ...	85	23/7/47
Cowra Experiment Farm (Ayrshires) ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys) ...	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys) ...	29	5/3/47
Fairbairn, C. P., Woomargama ...	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.) ...	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys) ...	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns) ...	49	15/1/47
Hann, O., Bomerah, Barrington ...	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys) ...	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrshires) ...	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus) ...	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns) ...	261	25/9/46
Knight, G., Tannabah, Coonabarabran ...	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires) ...	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys) ...	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys) ...	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys) ...	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys) ...	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys) ...	38	2/12/46
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns) ...	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus) ...	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	114	11/6/46
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns) ...	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus) ...	155	11/3/47
Wagga Experiment Farm (Jerseys) ...	15	1/2/47
Wallaga Lake Aboriginal Station ...	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus ...	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns) ...	23	25/2/47

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore ...	48	26/5/46
Aboriginal Station, Brewarrina ...	14	26/5/46
Aboriginal Station, Wallaga Lake ...	19	29/4/47
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School) ...	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home ...	37	26/2/47
Ehsman Bros., Inverell ...	39	29/8/48
Emu Plains Prison Farm ...	115	29/1/47
Fairbridge Farm School, Molong ...	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital ...	1	7/11/47
Goulburn Reformatory, Goulburn ...	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood ...	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell ...	53	10/4/47
Hunt, F. W., Spencers Gully ...	27	16/2/47
Koyong School, Moss Vale ...	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell ...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital ...	43	4/4/47
Lunacy Department, Gladesville Mental Hospital ...	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital ...	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital ...	57	30/10/46
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell ...	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell ...	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	10	1/5/47
Orange Mental Hospital ...	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass ...	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook ...	78	3/7/47
Rolfe, V. J., "Mount View," Inverell ...	18	9/2/47
St. Ignatius' College, Riverview ...	24	7/7/47
St. John's College, Armidale ...	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie ...	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale ...	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay ...	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale ...	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook ...	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook ...	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook ...	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook ...	66	8/10/48
William Thompson Masonic School, Baulkham Hills ...	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter ...	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook ...	54	12/5/46
Youth Welfare Association of Australia ...	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief Division of Animal Industry.

Calf Identification Scheme—For Improvement of Dairy Herds.

THE calf identification scheme made available by the Department of Agriculture to members of herd recording units affords positive identification of all female stock, with records of their production and breeding, and hallmark branding of calves of merit. Also, under this scheme, bulls of proven production strains are listed officially as certified sires and a certificate issued if required.

In selecting a dairy bull, more importance is now attached to its ability to get high producing daughters, than, as previously, to the production of its dam. That makes it necessary to introduce some positive system of identification of all female stock in a herd, a service which is now available on a voluntary and free basis to dairy farmers who avail themselves of the Department's herd recording scheme.

Under the identification scheme, members of herd recording units are entitled to have their stock identified by tattoo marks in the ears, indicating district, breeder and year of birth. In addition, calves qualifying for the hallmark of merit have the letter "M" in shield tattooed in the left ear. Under the scheme sires in use are eligible for a survey of their progeny.

A certified record of parentage and butterfat backing for any identified calf is issued on request, provided the sire of the calf is a certified bull under the scheme. The record shows all available particulars of the calf, its sire and dam; also the production of the sire's dam.

Excellent results have been obtained in individual herds under the Department's herd improvement scheme. This calf identification scheme will facilitate wider use of the results of herd recording for general improvement, particularly of grade herds, by indicating sources of high-grade stock. It will also provide the breeder with certified evidence of the excellence of his herd, which should popularise herd recording and result in its wider adoption.

Infectious Laryngotracheitis of Fowls.

Warning Against Indiscriminate Vaccination.

INFECTIOUS laryngotracheitis is known to be widespread in the poultry flocks of the County of Cumberland and to occur in some country districts. There must, however, be many flocks which are as yet uninfected, and farmers are particularly warned against indiscriminate vaccination in clean flocks.

Once the disease has occurred on a farm, one of four courses is open to the farmer to effect control:

1. Dispose of the entire flock and re-stock with one-day-old chicks or by the incubation of fertile eggs.

2. Arrange for vaccination, by persons authorised under the provision of the Stock Diseases Act, in the early stages of the outbreak of all unaffected birds.

3. Raise new season's stock completely segregated from all other fowls on the farm and adjoining farms.

4. Arrange for vaccination of new season's stock when eight weeks old or more, before they have opportunity to contact older stock.

Vaccination, when properly carried out by competent vaccinators, is a safe procedure. However, quite often a few "carriers" result, and these birds, although to all outward appearances normal, may carry the disease for the remainder of their lives and infect susceptible birds when they come in contact with them. There is, therefore, danger of setting up the disease by vaccination of a clean flock. Consequently, there is only justification for preventive vaccination when carriers of infectious laryngotracheitis are known to be present in older birds on the farm, or when an outbreak is anticipated or present on an adjoining farm.—MAX HENRY, Chief, Division of Animal Industry.

THE death of several pigs in the selling yards of a country town seemed to have been caused by eating cedar berries which fell into the pen.

THE AGRICULTURAL GAZETTE FOR FEBRUARY, 1947.

This Issue Contains:—

The Agricultural Gazette.

FEBRUARY, 1947.

Marketing Primary Products.

AN increasing demand for more and more regulatory control—either in the interest of grower, retailer or consumer—is some proof (if proof is needed) that our system of marketing primary produce leaves a lot to be desired.

Persistent demand for introduction of a docket system to check sales, for instance, evidences concern by growers that they are not always rendered a true account of what their produce brings. Growers who contract with retailers—particularly retailers in country towns—for direct sales of produce can produce further proof to support this claim.

Country retailers who obtain supplies from Sydney markets invariably pay more than suburban retailers, even after taking into account additional freight and handling charges. This is rarely, if ever, discernible on account sales rendered to growers whose produce finds its way to country centres.

Further, prices paid by consumers contrast so oddly with returns to growers as to suggest that all is far from right with our system of distributing primary products.

It could be that the present system is basically wrong. In secondary industries, for example, the aim is to disperse to consuming centres products of those industries immediately they are manufactured. In primary industries the opposite process operates. Immediately products are harvested (call it "manufactured" if you like) they are hurriedly transported to a congested central market. Up to that stage, distribution is in reverse gear, and when subsequently it does get under way, it is dependent on a "come and get it" system, so different to the highly organised distribution methods of secondary industries.

That we have never had decentralised markets (suburban and country) is no argument against their establishment now. This may not be a complete answer to our present marketing-of-primary-products problem, but it would seem to offer more than is likely to be achieved by any attempt to patch-up the present system.

Proposed Control Legislation for Artificial Insemination of Stock.

DRAFT legislation to control artificial insemination of stock practised on commercial lines has been prepared. Stock owners will be free to inseminate their own stock, but persons who desire to operate insemination centres will be required to obtain licenses from the Government.

Use of artificial insemination by unscrupulous or careless individuals could do great harm to the livestock industries, particularly dairying, said the Acting Minister for Agriculture, Mr. Dickson.

While insemination, generally, would tend to decrease spread of disease, there were certain diseases of dairy cattle which the practice may spread.

For protection of stock owners it had been found desirable in other countries to exercise control over use of this method of breeding. It was hoped, said Mr. Dickson, other Australian States would follow the lead to be given by New South Wales, as uniform legislation throughout all States was desirable.

The New South Wales bill, however, would provide that introduction of semen from other States and countries would be governed by Proclamation. That clause would safeguard against introduction of disease and would ensure that protection given to stock breeders by the New South Wales bill was not rendered ineffective by lack of legislative action elsewhere.

The proposed legislation was largely a machinery measure with wide regulation-making powers. It would be necessary, for instance, to specify diseases from which animals must be free, and to prescribe how licensed premises should be equipped for collecting, storing and packing semen.

The practice of artificial insemination would be controlled by requiring any person who desired to carry on an insemination centre to obtain a license from the Government. Control would not, of course, apply to those cases in which an owner desired to use artificial insemination on his own stock, but would apply in any case in which insemination was developed on commercial lines.

Creation of an artificial insemination centre was expensive. Necessary animals had to be purchased, maintained and trained, and laboratory accommodation provided. Trained laboratory workers had to be employed to examine and determine suitability of semen before use. Also it would be necessary to make sure that animals used at the station were free from certain diseases and that the staff was fully qualified to carry out the necessary work.

Use of artificial insemination was likely to increase in this country, particularly in connection with dairy cattle, although it might not expand under Australian conditions to the same extent as in countries where herds and flocks were smaller and settlement much closer.

Approved Vegetable Seed—February, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

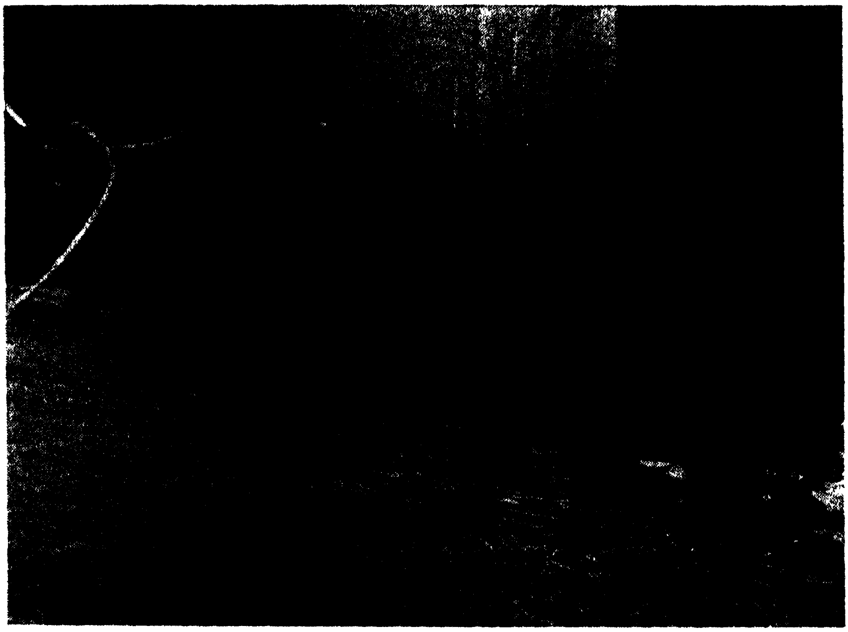
Condemned Fruit and Vegetables Not Sold to Barrowmen.

"Fruit and vegetables condemned by Inspectors in the city markets are not sold to barrowmen. A check is made to ensure that all produce condemned because of unsatisfactory condition is delivered to Municipal Council wagons for destruction." The Acting Minister for Agriculture (Hon. W. E. Dickson, M.L.C.), said this in denial of a recent statement that agents were defrauding growers by obtaining condemnation notes from Inspectors for fruit and vegetables not in best condition, then selling this poor quality produce to barrowmen, and failing to render accounts to growers. This alleged malpractice was said to be common when fruit or vegetables were in short supply.

Mr. Dickson explained that notices for destruction of fruit or vegetables were not issued by Inspectors until produce was in a decayed condition or otherwise unfit for sale to either barrowmen or retailers. Inspectors kept a check on this produce to see that it was destroyed, and not sold, to barrowmen.

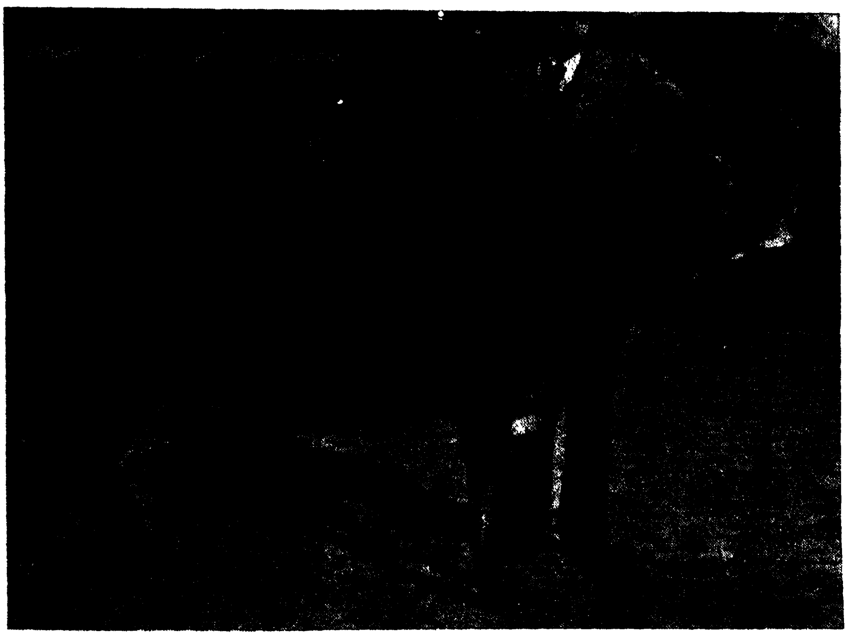
Further Stud Stock Purchased—

By the Overseas Delegation
Lead by Hon. E. H. Graham, M.L.A.,
Minister for Agriculture.



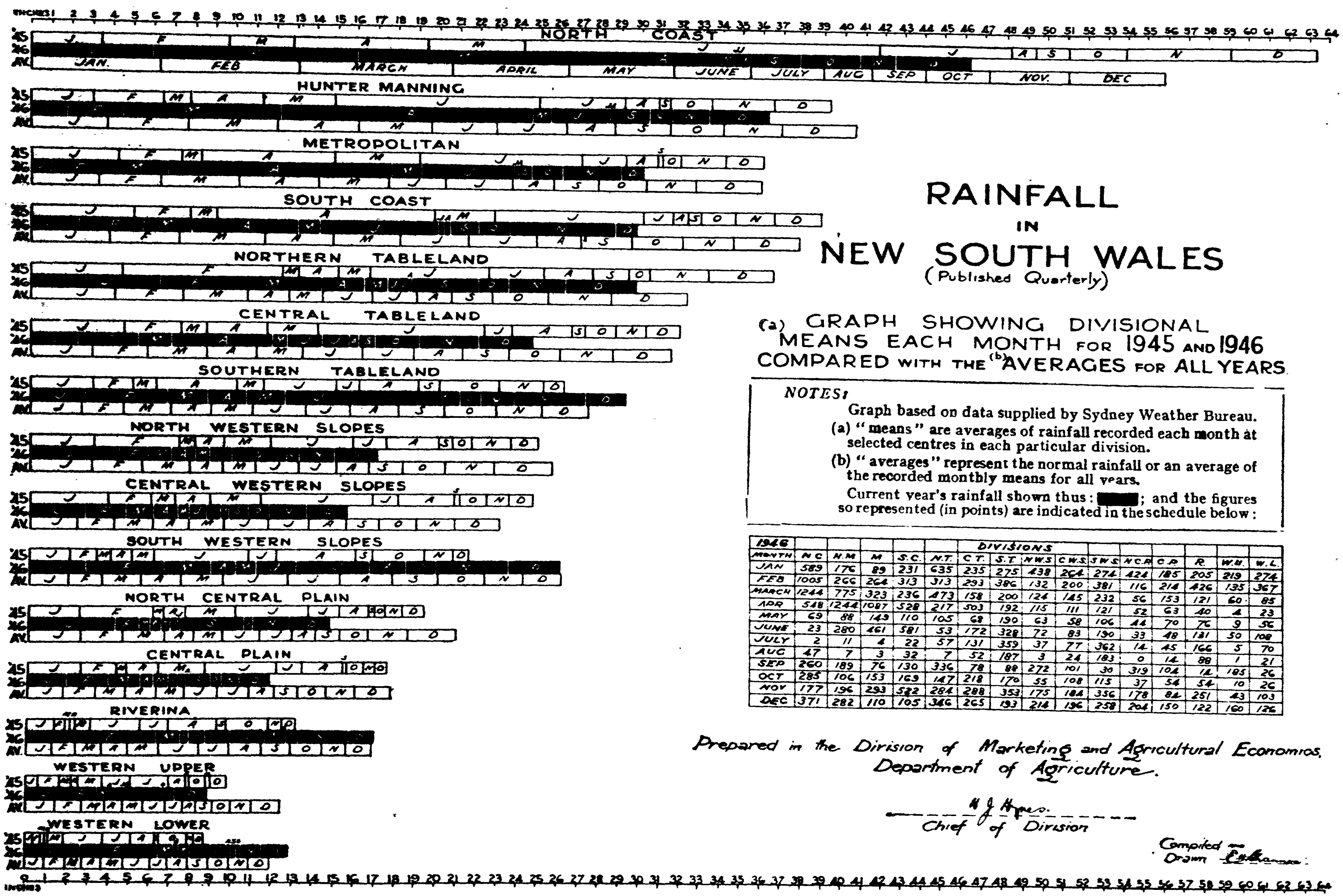
Among the stock purchased is the outstanding Aberdeen Angus bull "Erison of Harviestoun" classed by leading judges as one of the outstanding bulls in the United Kingdom at the present time. He will be a great acquisition to the Aberdeen Angus breed in Australia.

"Erison of Harviestoun" is by "Janrick of Dalmeny," possibly the most successful sire in Scotland today. "Janrick of Dalmeny." is the sire of "Ervillax of Harviestoun," and of "Erwin of Harviestoun," Perth Champions sold for 4,500 and 7,500 guineas respectively.



Included among the Jersey Purchases is the Bull, "Golden Conqueror."

A prize-winner at a recent leading show.



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

(a) GRAPH SHOWING DIVISIONAL MEANS EACH MONTH FOR 1945 AND 1946 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means for all years.

Current year's rainfall shown thus: ▬; and the figures so represented (in points) are indicated in the schedule below:

1946						DIVISIONS									
MONTH	N.C.	N.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN	589	176	89	231	635	235	275	438	264	274	424	185	205	219	274
FEB	1005	266	264	313	313	293	386	132	200	381	116	214	426	135	367
MARCH	1244	775	323	236	473	158	200	124	145	232	56	153	121	60	85
APR	548	1244	1087	528	217	503	192	115	111	121	52	63	40	4	23
MAY	69	88	149	110	105	68	190	63	58	106	44	70	76	9	56
JUNE	23	280	461	581	53	172	328	72	83	190	33	48	131	50	108
JULY	2	11	4	22	57	131	359	37	77	362	14	45	166	5	70
AUG	47	7	3	32	7	52	187	3	24	183	0	14	88	1	21
SEP	260	189	76	130	336	78	88	272	101	30	319	104	14	185	26
OCT	285	106	153	169	147	218	170	55	108	115	37	54	54	10	26
NOV	177	196	293	522	284	288	353	175	184	356	178	84	251	43	103
DEC	371	282	110	105	346	265	193	214	196	258	204	150	122	160	126

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

N. J. Hynes.
Chief of Division

Compiled and Drawn [signature]

Great Lakes Lettuce.

A Useful Imported Variety.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THE principal limiting factor in producing good quality summer lettuce in many districts in New South Wales is the "bolting" habit of the chief commercial varieties.

In America a variety known as Great Lakes (Brittle Ice x Imperial 152 x Imperial 615), developed by the Michigan Agricultural Experiment Station working with the United States Department of Agriculture, attracted attention because of its slowness to bolt at temperatures favouring seeding in commercial varieties.

Accordingly, in 1944, seed was procured by the New South Wales Department of Agriculture and trials commenced over a wide climatic range in New South Wales to determine whether Great Lakes would be a suitable summer lettuce under local conditions.

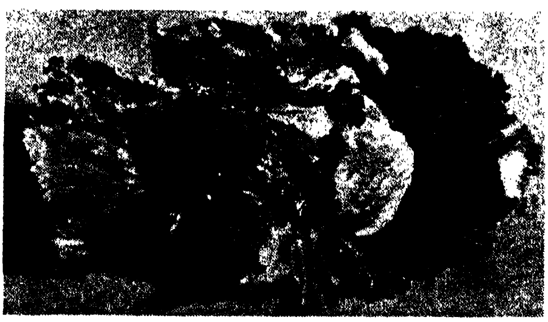
Results to date indicate that it is more adaptable to our inland districts than Imperial 847, and that it will extend the area in which high quality summer lettuce can be produced.

Brief Results of Trials.

The following is a brief summary of the results of trials conducted:—

On the Murrumbidgee Irrigation Area, Great Lakes is the best summer variety yet tested. The combination of quality, hardiness, lack of bolting and disease resistance make it superior to Imperial 847 and New York 44.

At Menindee, Great Lakes, given a severe test with hot winds, dust storms and temperatures of 100 to 117 deg. Fahr. for nine days, showed no signs of seeding or sweating. Heads had to be split to force a seed head.



A Typical Lettuce of Great Lakes Variety.

In the Hunter Valley, Great Lakes proved promising. Under summer conditions it hearted better and appeared less likely to run to seed than Imperial 847, although the appearance was considered less attractive.

At Grafton tests to date suggest that Great Lakes is inferior to Imperial 847.

At Hawkesbury Agricultural College, Great Lakes has proved to be a very desirable summer lettuce. Whilst it was later maturing and had greater proportion of leaf to head than Imperial 847, it did not bolt and had superior quality.

At Bathurst, Great Lakes showed resistance to tip-burn, but otherwise was not superior to Imperials 847 and 615.

In the metropolitan area, Great Lakes was sufficiently promising for recommendation as a summer lettuce, especially where losses are experienced through seeding of Imperial 847. However, it is two weeks later in maturity and does not appear to hold well in the field after maturity.

Description.

The variety produces a large percentage of marketable heads of first-class quality and flavour; medium to large in size and very compact. Leaves have serrated edges giving a frilled appearance. Outer leaves are dark green and glossy, the heart leaves being white. Texture is crisp and brittle.

Great Lakes is not prone to bolting. It has shown resistance to slime and tip-burn, but is susceptible to spotted wilt.

Seed supplies are available in limited quantities from commercial seed firms.

Seed Wheat, Oats and Barley for 1947 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat, oats and barley who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Apollo.—

Coddington, C. E. & A. R., Moulton Farm, Harden.
Kendall Est., B. W. J., Lulworth, Murrumburrah.

Baldmin.—

Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Trengrove, C. D., "Hillview," Koorawatha.
Watson Est. E. W., South Greenbank, Thuddungra, Young.

Baringa.—

Capps, A. E., & Sons, Wynfield, Cowra.
Amos, A. J., "Rockdale," Cowra.

Bencubbin.—

Stewart, J. M., "Bygoo," Ardlethan.
Stewart, J. L., "Meroola," Ardlethan.
Hawthorne, J. W., "Uley," Ardlethan.
Elder, J. L., "Rockhall Mains," Kamarah.
Carroll, F. J., "Killara," Ardlethan.
Richens, T. E., "Warrawee," Ardlethan.
Turnbull, J., & Son, "Sherwood Park," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Hawthorne, F. A., "Uley," Ardlethan.
Ballantyne, G. G., "Clifton," Ariah Park.
Renshaw, C., "Boogadah," Binnaway.
Heath, H. H., "Eugildry," Leadville.
Rowbotham Bros., Box Valley, Dunedoo.
Sullivan, T. P., Dunedoo.
Hookway, S., "La Questa," Leadville.
Deutcher, Les., Eden, Birriwa.
Ewin, C., "Fenella," Birriwa.
Granger, F. H., Black Hill, Birriwa.
Cummins, Est. P., Broula, Cowra.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Ward, G., "Girrawheen," Grenfell.
Keir, J. A., "Braeside," Grenfell.
Wood, K., "Boongalla," Rocky Glen, via Coonabarabran.
McEvoy, J., "Levuka," Gugaldie.
Howe, K., Bungowannah.
Ross, R. D., Brocklesby.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Hutson, F. O., Walbundrie.
Adams, A. H., Farm 161, Stoney Point, via Leeton.
Amos, A. J., "Rockdale," Cowra.
Ashworth, E. J., Landawne, Bathurst Road.
Arnold, R., Farm 19, Corbie Hill Road, Leeton.
Baker, M., Temora.

Bencubbin—continued.

Bradford, R. & V., Cooringee, Nubba, via Wallendbeen.
Blythe, D., North Groongal, Carrathool.
Bowditch, C., Farm 1390, Hanwood.
Boxsell, L. B., "Cherry Wood," Cullinga Mines, via Wallendbeen.
Carey, J. & Sons, Numalla, via Trundle.
Cuthbert, H. H., Grong Grong.
Cooper, S. J., Rock Dale, Barmedman.
Davy's Plains Pty. Ltd., Cudal.
Davidson, D., Calitris, Young.
Denyer, A. N., Mimosa Road, Temora.
Davis, O. P., "The Pines," Gumble.
Dickie, Mrs. A., Box 106, VV, Griffith.
Davison, N. R., Werrington, Cunningar.
Edwards, J., Eglington.
Elliott, H. O., "Fairfield," New Grenfell Road, Forbes.
Forsythe, J. G., "Gwandolan," Cootamundra.
Hart, J. K., Lagoona, Galong.
Herbert, T. J., "Carnarvon," Road Mail Box 519, Leeton.
Johnson, R. R., "Umarla," Forbes Road, Grenfell.
Jones, E. G., "Renee Vale," West Wyalong.
Killick, K. P., Illawa, Galong.
Kelly, W. G., "The Oaks," Barmedman.
Kendall Est., B. W. J., Lulworth, Murrumburrah.
Love, R. B., "Yarrabundle," Trundle.
Marchington, S., Box 618 KK, Griffith.
McDowell, E. J., Purlewaugh, Ulamambri.
Mullens Bros., Goragilla, Binnaway.
Michalk, G. B., "Westwood," Eugowra Road, Parkes.
Mailer, R. V., Trundle Park, Bogan Gate Road, Trundle.
Noakes Bros., "Rose Farm," R.M.B., 46, Thuddungra.
O'Neill, W. A., "Yarra," Cowra.
O'Neill & Bowlding, "Frogmore," Est., Frogmore.
Phillips, A., "Ratho," Young.
Pfitzner, A., Stack Pool, Goolgowi.
Rowlands, K., "Wilverlyn," New Grenfell Road, Forbes.
Rowlands, E. J., "Green Hills," New Grenfell road, Forbes.
Reynolds, S. R. & Bellamy, "Burrawong," Cumnock.
Stephens, E. F., Farm 1079, Murrami.
Scott, W. J., Lansdowne, Bathurst Road.
Scott, Est. J., Hillview, Cootamundra.
Trotman, R. E., "Norton," New Grenfell road, Forbes.
Tremain, W., Obley-road, Yeoval.

Bencubbin.—continued.

Thompson, J. & Patton, T., "Baroona," West Wyalong.
Watts, E. J. & Sons, Private Bag, Euraley, via Narrandera.
Wells, W., Goolgowi.
Windus, L. R., Cudal.
Watts, W. C., Gumble, via Manildra.
Wallace Bros., "Dungavan," Temora.
Young, J., "Southern Wood," Cumnock.
Young, C. R., "Hillcrest," Ulamambri.
Trevaskis, C. L., and Turner, W. T., "Yarran Lea," Ariah Park.
Trevaskis, E., "Yarran Lea," Ariah Park.
Mann, R. S., "Ocean View," Lake Cargelligo.
Rumble, F. D., "Weventure," Muttama.
Gorham, A. A., "Oak Hill," Boorowa.
Armstrong, H., "Allendale," Boorowa.
Armstrong, K., "Heathfield," Boorowa.
Holden, T., Box 210, Griffith.
Heath, E. A., "Acres," via Yenda.
Doyle, J. O., Yenda.
Goldberg, S., Griffith.
Dennis, S. A., c.o. D. L. Cox, Private Bag, Narrandera-road, Wagga.
Westman, S., Clifton Park, Euberta.
Lucas, S., Springfield, Coolamon.
Bradley, P., Dullah, via Coolamon.
Bredin, R. W., Alderbury, Coolamon.
Higman Bros., Rannock, via Coolamon.
Edwards, H. T., Pullitop.
Woods, W. J., Burrandana.
Jenkins, C. D., Kyalla, Burrandana.
Johnston, G. J., Fairview, Burrandana.
Davidson, S. P., Strathdene, Mangoplah.
Taber, C. J., Glenburn, R.M.B. 185, Collingullie.
Cox Bros., Granville, Collingullie.
Kanaley, S. J., Hazeldene, Marinna.
Mitchell and O'Halloran, R.M.B. 340, Albury-road, Wagga.
Harper, estate A., Waratah, Albury-road, Wagga.
Croudace, K. P. B., Waverley, Mangoplah.
Hart, C. S., Temora-road, Old Junee.
Carlon, Ron., Arcaroola, Old Junee.
Smith Bros., Brooklyn, Ladysmith.
Scott, H. U., Buccleuch, Coreinbob.
Rodham, J. H., Uranquinty.
Poulter, E., Kilburnie, The Rock.
Lockwood and Baker, Compton, Gregadoo.
Leonard Bros., "Sommerfield," Birriwa.
Erwin, Mr., "Fenella," Birriwa.
Burke, Mr., "Durrie," Birriwa.
Deutcher, Mr., "Eden," Birriwa.
Rains, S. V., "Mongarlow," Birriwa.
Gudgeon, Mr., Gulgong.
Gleeson, Mr., Stony Creek, Cooyal.
Ryan, J. M. and J. J., "Clandora," Berrigan.
Thornton and Sons, Spring Farm, Berrigan.
Moore, C., Finley-road, Deniliquin.
McRae, W., Urangeline East.
Carnegie, D., Holbrook.
Altmier, J., Splitter's Creek (Albury).
Scheetz, I. P., Brocklesby.
Schilg, S. and K., Burrumbuttock.
Paech, L. R., Walla.
Moll, G., Gerogery.
Mazzocchi, J. J., Culcairn.
Montague, J. A., The Rock.
Howard, E. C., Yerong Creek.

Bencubbin—continued.

Barker, E. J. H., Walbundrie.
Hutson, F. J., Walbundrie.
Scott, W. B., Henty.
Scott, W. J., Henty.
Obst, K., Lockhart.
Leddin, D., Urangeline East.
Leischke, T. A., Walla.
Leischke, I. J., Walla.
Hutchings, G. F., Yerong Creek.
Smith, G., Cookardinia.
Schulz, F. G., Henty.
Newton, D., Urangeline East.
Inwood, A. N., "Toulon," Glanmire, via Bathurst.

Bobin.—

Reid, G., Moorwartha.
Scott, W. B., Henty.
Brown W., Daysdale.
Henderson, J. H., The Rock.
Leischke, J. S., Walla.
Leischke, I. J., Walla.
Bredin, R. W., Alderbury, Coolamon.
Seymour Bros., Rocky Hill, Marrar.
Boothey, O. H., Coromondel, Temora-road, Coolamon.
Boothey, L. H., St. Alban's, Temora-road, Coolamon.
Turner, W. A., Iona, Old Junee.

Bordan.—

Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
Payten, J., "Kaloola," Goolagong.
Barber, A. E., "Embrose," Baldry.
Balcombe, H. J., "Pekoona," Toogong.
Cullen Bros., Harden.
Davis, O. P., "The Pines," Gumble.
Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
Killick, K. P., "Illawa," Galong.
Kelly, W. G., "The Oaks," Barmedman.
Lodge, C. E., "Ellerslie," New Grenfell road, Forbes.
Love, R. B., "Yarrabundle," Trundle.
McLaren, R. W., "Glenmore," Barmedman.
Malcolm, A. D., Farm 1039, Colando, via Leeton.
McCormack, A., Farm 159, Stoney Point, via Leeton.
Quodling, W. J., "Garangery," Corbie Hill road, via Leeton.
Russell, L. J., Morongla.
Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
Scott, Est. J., "Hillview," Cootamundra.
Thackeray, R. H., "Woornack," Young.
Watts, E. R., Bald Hills, Manildra.
Holden, T., Box 210, Griffith.
Delaney, F. C., 39 Banna-avenue, Griffith.
White, H., c.o. A. Rowlands, "Hilton," Mandurama.
Tipping, A., Bowden Farm, Tooyal North.
Maloney, estate P. J., Kincora, Coolamon.
Menzies, P., Dunrobin, Coolamon.
Edwards, H. T., Pullitop.
Beazley, L., Glenorchy, Albury-road.
Carlon, Ron, Arcaroola, Old Junee.

Bordan.—continued.

Flanagan, T. M., Yallambee, Ladysmith.
Caldwell, J. D., and Sons, Berrigan.
Whiley and Purser, Millthorpe.
McPhillamy Bros., P.O. Box 30, Oberon.
Montague, J. A., The Rock.
Paech, E. J., Henty.
Leischke, J. S., Walla.
Hutchings, G. F., Yerong Creek.
Gardiner, N., King's Plains, via Blayney.
Gardiner, A. K., King's Plains, via Blayney.
Gordon, G., Moorilda, via Newbridge.
Edwards, G., "Terlea," Box 15, Newbridge.
Toohey, A. and Masters, A., Barry, via Blayney.
Blazley, R., Carcoar.
Blazley, H., Carcoar.
Burns, W., "Goongirwarrie," Carcoar.
Stonestreet, E. E., Greghamstown, via Blayney.
Marriott, W., Box 30, Millthorpe.
Pearce, G. W., "Springfield," Orange.

Bungulla.—

Burke, Mr., "Durrie," Birriwa.
Trevaskis, E., "Yarran Lea," Ariah Park.

Celebration.—

Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Charter.—

Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
Thackeray, R. H., "Woornack," Young.
Jenkins, C. D., Kyalla, Burrandana.
Rodham, J. H., Uranquinty.
Read, G., Wyrilla, Uranquinty.
Reynoldson, A., "Carramar," Berrigan.
Moore, R. A. and J. M., Cullivel.

Dundee.—

Aitken, W. H., "Afton," Beckom.
Carroll, F. J., "Killara," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Howe, K., Bungowannah.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Humphries, K., Bungowannah.
Barrett, G. & C., Woodridge, Manildra.
Langfield, R., Morongla.
Quinn, W. A., "Inglewood," Young.
Wallace Bros., Dungavan, Temora.
Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
Bradley, P., Dullah, via Coolamon.
Menzies, P., Dunrobin, Coolamon.
Edwards, H. T., Pullitop.
Main, G., jnr., Ardrossan, Illabo.
Mitchell and O'Halloran, R.M.B. 340, Albury-road, Wagga.
Harper, estate A., Waratah, Albury-road, Wagga.
Macrae, A. J., Lucerne Vale, Mangoplah.
Croudace, K. P. B., Waverley, Mangoplah.
Rodham, J. H., Uranquinty.
Warren, W., Ellwood, Illabo.
Shelly, A. W., Howlong.
James, A. C., Yerong Creek.
Newton, D., Urangeline East.
Sellwood, R. C., Urangeline East.
Clancy, J., Urangeline East.
Pearce, R., Corowa.

Dundee.—continued.

Reid, G. D., Moorwartha.
Scheetz, I. P., Brocklesby.
Schilg, S and K., Burrumbuttock.
Schilg, O., Burrumbuttock.
Montague, J. A., The Rock.
Murphy, A. G., Henty.
Munro, D., Daysdale.
Patey, R., Daysdale.

Echo.—

Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Eureka.—

Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
Cartwright, F. C., "Boundary Villa," Sebastopol.
Renshaw, C., "Boogadah," Binnaway.
Stapleton, H., "Gundamain," Cudal.
Wallace Bros., Dungavan, Temora.
Murphey, W. T., Yerong Creek.
Proctor, Mrs. F. J., Bungowannah.
Smith, G., Cookardinia.
Moore, R. A and J. M., Cullivel.
Lucas, S., Springfield, Coolamon.
Tresco Farming Co., Box 624, Griffith.
Woodside, J., Boree Plains, Griffith.

Eureka 2.—

Ballantyne, G. G., "Clifton," Ariah Park.
Ridley, J., Hilltop, Collingullie.

Fedweb.—

Hodges, C. H. & Sons, Baldry.
Moore, R. A. and J. M., Cullivel.
Coon, J. A., "Homeleigh," Coonabarabran.

Ford.—

Stewart, J. L., "Meroola," Ardlethan.
Carroll, F. J., "Killara," Ardlethan.
Capps, E. A., & Sons, Wynfield, Cowra.
Walker, F. W., "Glenelg," Canowindra.
Keir, J. A., "Braeside," Grenfell.
Ross, C. E., Brocklesby.
Frohling, W., Moorwartha.
Hutson, F. O., Walbundrie.
Balcombe, H. J., "Pekoona," Toogong.
Balcombe, R. A. H., "Sussex," Toogong.
Bendle, W. J., "Bankside," Monteagle.
Coddington, H. G., "Invergowrie," Young.
Davis, O. P., "The Pines," Gumble.
Gray, F. A., "Sterling Chase," Cudal.
Garry, J., "Burramunda," Grenfell-road, Young.
Glenn, A., Farm 1428, Murrami.
Hart, J. K., Lagoona, Galong.
Hall Bros., "Ellerslie," Wallendbeen.
Hodges, C. H., Baldry.
Johnson, T., Farm 348, Wamoon.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
King, F. R., Farm 388, Wamoon.
Killick, K. P., Illawa, Galong.
Langfield, R., Morongla.
Martens, C. F., "Quamby," Grenfell-road, Young.
Murray, R. S., "Maryville," Cudal.
Marchington, S., Box 618KK, Griffith.
Rickets, C. T., "Peak View," Young.

Ford—continued.

Stapleton, H., "Gundamain," Cudal.
Scott, Est. J., Hillview, Cootamundra.
Salmon, M. T., Pucawan.
Tremain, W., Obley-street, Yeoval.
Thackeray, R. H., "Woornack," Young.
Thornberry, L. C., "Waverty," Private Bag, Cudal.
Watson, Est. E. U., South Greenbank, Thuddungra, via Young.
Howard, G., Springdale.
Gordon, T., "Godolphin," East Guyong.
Bennett, J. W., "Taringa," Box 15, Blayney (Vittoria Mail Service, via Blayney).
Saundry, L. W., Millthorpe.
Hutson, F. J., Walbundrie.
Carnegie, D., Holbrook.
Pearce, R., Corowa.
Moll, G., Gerogery.
Schilg, O., Burrumbuttock.
Warren, R. H., The Rock.
Webb, J., Gerogery.
Burke, Mr., "Durrie," Birriwa.
Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
Johnston, C. J., Fairview, Burrandana.
Davidson, S. P., Strathdene, Mangoplah.
Brunskill, A., Allonby, Wagga.
Harper, estate A., Waratah, Albury-road, Wagga.
Croudace, K. P. B., Waverley, Mangoplah.
Cotterell, Mr., Ladysmith.
Warren, W., Ellwood, Illabo.
Cox Bros., Granville, Collingullie.
White, H., c.o. A. Rowlands, "Hilton," Mandurama.
Fraudenstein, R. D. and B., "The Ranch," Greenthorpe.
Trevaskis, C. L. and Turner, W. T., "Yarran Lea," Ariah Park.

Gabo.—

McColl & Sons, H. O., "Strathmore," Koorawatha.
Boxsell, L. B., "Cherry Wood," Cullinga Mines, via Wallendbeen.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
Kendall, Est. B. W. J., Lulworth, Murrumburrah.
McClintock, M., Mannamite, Cootamundra.
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
Rickets, C. T., Peak View, Youn ;.
Roberts, N., "Hillside," Cootamundra.
Scott, Est. J., "Hillview," Cootamundra.
Rathbone, R., Box 101, Griffith.
Tipping, A., Bowden Farm, Tooyal North.
Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
Lucas, S., Springfield, Coolamon.
Higman Bros., Rannock, via Coolamon.
Brunskill, A., Allonby, Wagga.
Bartlett, G., Avondale, Coolamon.
Schultz, F. G., Henty.

Ghurka.—

Stewart, J. M., "Bygoo," Ardlethan.
Baker, M., Temora.
Wallace Bros., Dungavan, Temora.
Mohr, H. Q., Glengarrie, Mangoplah.

Ghurka—continued.

Holden, T., Box 210, Griffith.
Delaney, F. C., 39 Banna-avenue, Griffith.
Barbour, S., Box 15, Griffith.

Gular.—

Stewart, J. M., "Bygoo," Ardlethan.
Hutson, F. O., Walbundrie.
Barker, E. J., Walbundrie.
Hutson, F. J., Walbundrie.
Burke, Mr., "Durrie," Birriwa.

Javelen.—

McLaren, R. W., "Glenmore," Barmedman.

Kendee.—

Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Koala.—

Cummins, Est. P., Broula, Cowra.
Payten, J., "Kaloola," Goolagong.
McEvoy, J., "Levuka," Bugaldie.
Cassells, W. T., "Omagh," Frogmore.
Carey, J. & Sons, Numalla, via Trundle.
Forsythe, J. G., Gwandolan, Cootamundra.
Hall Bros., "Ellerslie," Wallendbeen.
Hodges, C. H. & Sons, Baldry.
Hurle, A. M., Grogan.
Killick, K. P., "Illawa," Galong.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
McClintock, M., Mannamite, Cootamundra.
Russell, L. J., Morongla.
Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
Scott, Est. J., Hillview, Cootamundra.
Trotman, R. E., "Norton," New Grenfell road, Forbes.
Scott, W. B., Henty.
Campbell, C. C., Henty.
Higman Bros., Rannock, via Coolamon.
Menzies, P., Dunrobin, Coolamon.
Seymour Bros., Rocky Hill, Marrar.
Bartlett, G., Avondale, Coolamon.
Poulter, E., Kilburnie, The Rock.

Kondut.—

McLaren, R. W., "Glenmore," Barmedman.

Nabawa.—

Watts, E. J. & Son, Euroley, via Narrandera.
O'Donoghue, J., Yerong Creek.

Pusa 4.—

Stewart, J. L., "Meroola," Ardlethan.
Aitken, W. H., "Afton," Beckom.

Ranee.—

Salmon, M. T., Pucawan.
Caldwell, J. D. and Sons, Berrigan.

Ranee 4H.—

Pearce, R., Corowa.

Rapier.—

Aitken, W. H., "Afton," Beckom.
Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.

Rapier—continued.
- Amos, A. J., "Rockdale," Cowra.
- Coddington, J. T., "Homeleigh," Cunningar.
- Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
- Hodges, C. H. & Sons, Baldry.
- Jones, E. G., "Renee Valley," West Wyalong.
- Langfield, R., Morongla.
- Murray, R. S., Maryville, Cudal.
- Boothey, O. H., Coromondel, Temora-road, Coolamon.
- Scott, W. B., Henty.
- Patey, R., Daysdale.
- Cullen, W., Gerogery West.
- Sargeant, A., Table Top.
- Howard, E. C., Yerong Creek.
- Schulz, F. G., Henty.
- James, A. C., Yerong Creek.

Regalia.—
- Way, A. J., Berrigan.
- Nesbett, K. W. and D. H., Yarranvale, Deniliquin.
- Munro, D., Daysdale.

Totadgin.—
- Aitken, W. H., "Afton," Beckom.

Turvey.—
- Reid, G., Moorwartha.
- Frohiing, W., Moorwartha.

Ula.—
- Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Waratah.—
- Weir Bros., Holmwood, via Cowra.
- McColl, H. O., & Sons, "Strathmore," Koorawatha.
- Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
- Bourke, P., Harden.
- Corcoran, J. R., "Ballyryan," Boorowa.
- Forsythe, J. G., Gwandolan, Cootamundra.
- Garry, J., Burramunda, Grenfell-road, Young.
- Killick, K. P., Illawa, Galong.
- McCarthy Bros., East Grove, McMahon's Reef, Galong.
- Salmon, M. T., Pucawan.
- Thackeray, R. H., "Woornack," Young.
- Ward, R., Gilgal, Frampton.
- Barker, E. J. H., Walbundrie.
- Munro, C., Walla.
- Paech, L. R., Walla.
- Sargeant, A., Table Top.
- Cullen, W., Gerogery West.
- Webb, J., Gerogery.
- Montague, J. A., The Rock.
- Clancy, J., Urangeline East.
- Carnegie, D., Holbrook.
- Leischke, J. S., Walla.
- Murphy, W. T., Yerong Creek.
- Palmer, B., Wandana, Ladysmith.
- Lucas, S., Springfield, Coolamon.
- Johnston, G. J., Fairview, Burrandana.
- Davidson, S. P., Strathdene, Mangoplah.
- Cox Bros., Granville, Collingullie.
- Beazley, L., Glenorchy, Alburyroad.
- Flanagan, T. M., Yallambee, Ladysmith.

Waratah—continued.
- Smith Bros., Brooklyn, Ladysmith.
- Poulter, E., Kilburnie, The Rock.
- Walker, A., c.o. J. H. Kendall, Miarb, The Rock.
- Kelly, D., Hawthorne, The Rock.
- Armstrong, K., "Heathfield," Boorowa.

Warigo.—
- Goldberg, Dr. S., Griffith.

Yalta.—
- Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

Oats.

The Commonwealth Prices Commissioner has fixed the ceiling price at 5s. 6d. per bushel, F.O.R. grower's rail siding, for approved graded seed oats as listed in the "Agricultural Gazette."

Algerian.—
- Capps, E. A., & Sons, Wynfield, Cowra.
- Howard, G., Springdale.
- McClintock, M., Mannamite, Cootamundra.
- Starr, W. C., Box 6, Guyra.
- Burns, W., Goongirwarrie, Carcoar.
- Gardiner, N., King's Plains, via Blayney.
- McLellan, D. J., Walla.
- Webb, J., Gerogery.
- Dickson, A. S., "Yurunga," Oberon.
- Smith Bros., Brooklyn, Ladysmith.
- Jenkins, C. D., Kyalla, Burrandana.

Algeribee.—
- Davidson, S. P., Strathdene, Mangoplah

Belar.—
- Hockings, J., Bumbaldry, via Cowra.
- Batkin, E. A., Greenthorpe.
- Humphries, K., Bungowannah.
- Campbell, A., "Billabulla," Young.
- Hall Bros., "Ellerslie," Wallendbeen.
- Quinn, W. A., Inglewood, Young.
- Salmon, M. T., Pucawan.
- Wallace Bros., Dungavan, Temora.
- Carter, J. S., Gerelgambeth, Illabo.
- Humphries, K., Bungowannah.
- Davidson, S. P., Strathdene, Mangoplah.
- Carlon, Ron, Arcaroola, Old Junee.

Burke.—
- Marshall, A. O. & B. C., "Pinelodge," Canowindra.

Fulghum.—
- Crick, T. F., Binginbar, Gollan.

Guyra.—
- Whiley and Purser, Millthorpe.
- Simpson, F. S., Milton, Guyra.

Lampton.—
- Thompson, R., Melrose Farm, Glen Innes.
- King, H. S., Glenroy, Llangothlin.

Reid.—
- Simpson, F. S., Milton, Guyra.

Barley.

Prior.—
- Wallace Bros., Dungavan, Temora.

ARMILLARIA ROOT ROT CONTROL.

Use of a Water Jet to Expose Citrus Crown Roots.

E. C. LEVITT, H.D.A.,
Fruit Instructor

The Spray Jet in Action, Removing Soil to Expose the Crown Roots.

A VALUABLE contribution to the control of Armillaria root rot in citrus is the demonstration of the fact that the crown roots can be bared of soil quickly and easily with the aid of the ordinary motor spray outfit using a water jet.

The exposure of the roots at the base of citrus trees to prevent the extension of the fungus from an infected root to the crown—thus saving the tree from death—is a well established practice, but it is not carried out as often as desirable because of the high cost of doing the work by hand.

The discovery of the method of using a water jet for this purpose is the more valuable, since the necessary equipment is either already available on the orchard or can be hired at a relatively low cost.

Power off-take Spray Plant used in the Trials.

In the trials made a tractor-drawn-power offtake operated spray plant with one hose and spray rod carrying the usual single nozzle fitted with a 1/8th inch aperture plate only—strainers, etc., being removed—was employed. Operated at 250 to 300 lb. per square inch, on sandy loam soil liberally sprinkled with small stone and regarded as too hard for hand working, the crown roots were bared in 3½ to 5 minutes per tree without injury to the roots. The quantity of water required ranged from 9 to 14 gallons per tree.

The same work carried out by hand required from 20 to 30 minutes and was accompanied by considerable root injury.

The use of the spray nozzle fitted with the aperture plate only—producing a slightly

(*Continued on page 71.*)

The Post-war Market
Will Demand . . . .

HIGH QUALITY APPLES AND PEARS.

Need for Improved Cultural and Marketing Methods.

E. C. WHITTAKER and J. A. HOLBECHE, Fruit Instructors.

THE past few seasons have given rise to what may be termed a false sense of values so far as apples are concerned. This was inevitable under the circumstances which existed as the result of the shortage of supplies on the local market and the high purchasing power of the consuming public.

However, growers should realise that such a state of affairs cannot last and that, in fact, the peak or boom period is already past. It is hoped that the following notes will prove of value to those growers who, because of conditions in recent years, have allowed slack methods to take the place of sound, proven procedure.

The shortage of supplies was merely the logical outcome of the marshalling of all available transport facilities for more important freights than apples during the war years. Since the supplies from other States were limited, New South Wales apple growers were in the happy position of being able to exploit to the full what virtually amounted to a closed market—a market moreover with a potential consumption of 2½ to 3 million cases per year, whereas the New South Wales production of apples during those years has been less than half that figure.

Is it any wonder that prices reached unheard of levels, or that classes of fruit, which in pre-war years would have been dumped, brought highly remunerative prices?

Competition Again from Other States.

However, as transport and other facilities gradually return to normal conditions, we will again have to meet strong competition from other States, and it behoves every grower, therefore, to look to his production and marketing methods with a view to meeting this competition.

The idea is altogether too prevalent amongst a certain class of grower that because of an alleged much higher quality of New South Wales grown apples, there is little need to worry over interstate competition.

Such a statement is without any justification. We may have a slight advantage as regards quality in the case of one or two lines, but this, on its own, may not mean such a lot if the market is over-supplied with even reasonably good fruit, well presented—and the fact remains that not all our fruit, even of these few outstanding lines, is of exceptional quality by any means.

Pruning.

If high quality fruit is to be expected every attention must be given to pruning. Correct methods of pruning to suit the varieties being handled, and skilled workmanship, are necessary to obtain best results. Efficient pruning can help to remedy the alternate cropping habits of some varieties, and the removal of weak and diseased wood and the thinning out of fruit spurs assists to eliminate much of the small and inferior fruit often found on trees which receive little or no pruning.

In addition, correct pruning of the trees can play a part in improving the efficiency of the control measures which must be followed to deal effectively with pests and diseases. The importance of removing mildewed twigs on apples affected with powdery mildew is one example of how pruning can assist in the control of disease.

Cultivation Methods.

Undoubtedly the soil management practices adopted play an important part in the quality of fruit produced, and careful attention to all aspects of this part of the orcharding operations will assist in achieving high quality.

During recent years special attention has been drawn to the importance of protecting the soil from erosion, and to various methods of improving soil fertility.

Where excessive cultivation has caused a serious loss of humus and soil, the lack of plant nutrients and moisture has meant a continual struggle to mature crops of sufficient size to be marketable. Protection of the soil against erosion, and a sufficient supply of humus, mean maximum penetration and retention of moisture, and with a reasonable rainfall good sized fruit can be expected.

Pests and Diseases.

No orchardist can fail to appreciate the importance of controlling pests and diseases, as these can be, and often are, the main limiting factor in the production of high quality fruit.

Although there are effective control measures for most pests and diseases, it is essential that the grower should not only fully understand what is required, but that he should also be prepared to pay thorough and continual attention to every detail of the work. Often too much reliance is placed on sprays, and little or no attention is given to orchard hygiene. Spraying is not a "cure-all," and if done indiscriminately, is useless. The efficiency of this operation depends on the machine, the pressure, type of nozzles, correct timing of sprays, satisfactory material and—most important of all—the skill of the operator.

With the insect pests and often with some diseases also, orchard hygiene measures are just as important as sprays. Codling moth cannot be effectively controlled unless careful attention is paid to the winter clean-up of hibernating grubs and the removal of infested fruit from the tree.

Efficient spraying at the right time will prevent most fungous diseases, but it will not cure trees which are already affected. Black spot has caused huge losses of fruit in seasons which have favoured its development; these losses need not have occurred if preventive measures had been taken. The cost of a few preventive sprays each year, is a small premium to pay to insure against the loss of the crop through disease.

Thinning.

With some varieties, notably the Jonathan apple, the quality of the fruit, particularly as regards size, can be improved considerably by thinning out the crop where it is heavy or too clustered. More attention should be paid to this desirable practice, especially with earlier varieties which mature their fruits quickly or with any variety which tends to set alternate crops.

Harvesting.

A crop of highest quality fruit can be ruined during harvesting through failure to appreciate the need for giving this operation careful attention. There is need for a better understanding of the correct stages at which to harvest the various varieties. During the past few years when orchardists have been forced to make the best use they could of the labour offering it has been common to see high quality fruit reduced to poor quality because of careless handling, or through harvesting at an immature or over-mature stage.

The actual picking operation calls for some skill and much care. What appear to be small details, if overlooked, may cause much deterioration in the quality of the fruit.

Cool Storage.

Far too much fruit reaches the markets ex cool store in poor condition, and it is apparent that many growers still do not appreciate the fact that something more is required than that fruit should appear in good condition when taken from the cool store.

It should be realised that the effect of cool storage is merely to slow down the normal ripening process, and not entirely to arrest it; hence the longer the fruit is kept in cool store the riper it becomes, until such time as it passes its prime and commences to deteriorate.

Apples taken from the store late in the season may look to be in fair order, but once in the warmer atmospheric conditions, the decline in texture and flavour is rapid. Usually up to a week or more may elapse between removal from the cool store and consumption, and it is therefore obvious that fruit should be marketed before and not after reaching maturity.

For long period storage only good quality fruit from full crops on mature trees should be used. Large fruit, fruit from young trees, and fruit from lightly cropped trees are risky

propositions for storage beyond a relatively short period.

More attention should be given to storing promptly after picking. With the exception of Granny Smith, and to a lesser extent Democrat, all apples should be placed in the cool store, if intended for long period storage, with the least possible delay. In the case of Granny Smith and Democrat a week or so in common storage makes little difference to the ultimate storage life, but such shed storage should not be unduly prolonged and on no account should Granny Smiths for long storage be placed in store without wrapping in oiled wraps.

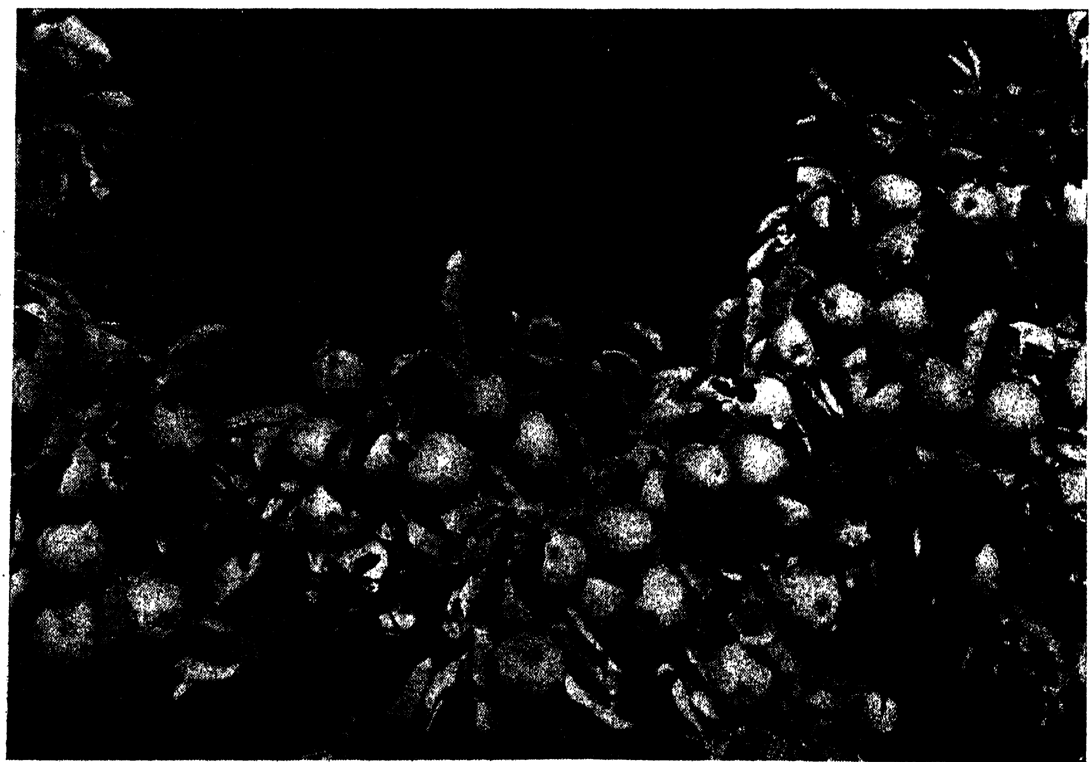
More attention could also be paid to the handling and stacking of fruit in cool store. Instances have been noted where cases have been walked over, or used as roller-conveyor supports during stacking operations—resulting in severe bruising of the contents. The provision of air spaces through the stacks is of importance. Solid stacks may be easy to build up, but are not in the best interests of the fruit—often resulting in premature deterioration.

Handling and Preparation for Market.

Even the best of fruit can be spoilt by faulty handling during marketing, and it is here, in particular, that many "slip-slop" methods, which from necessity or choice have been indulged in during the past few years, will need to be eliminated in the future if prices are to be kept up to remunerative levels.

This applies to the handling and stacking of cases in packing sheds, cool stores, railway trucks, lorries, etc.

It is not an unusual sight to see good fruit literally thrown into the hopper of sizing machines, odd cases stacked on their bulge and men walking or climbing over cases in stacks. It must be realised that in the natural course of events a case is handled many times from the time the fruit is picked until the consumer gets it, and if each handling results in only slight damage in the way of bruises and skin markings the



Fruit That is a Credit to the Grower.
Produced at a cost of much time, money and labour.
It could be completely ruined by faulty handling during harvesting and marketing.

aggregate is liable to be pretty large by the time it reaches its final destination.

A large proportion of the present day cases are either flimsy or badly cut, and even with the best of handling fruit packed therein is liable to a certain amount of damage. There is room for considerable improvement in the cases—in the direction of stouter side-boards for pine cases and closer cutting to the correct specification and some degree of seasoning to minimise the shrinkage and buckling which is all too prevalent in the case of hardwood boxes.

As it is, owing to faulty cutting, shrinkage and warping, it is very often extremely difficult to pack to the recognised standard packs, and furthermore, after packing, the fruit is sometimes seriously damaged by the rough and badly cut timber, and from the side bulges caused by flimsy side-boards.

Under the grading regulations, certain markings on the case are compulsory—such as the grower's name and address, the variety, count or size of the grade—and it should be kept in mind that the marks are there for a definite purpose, and not merely to give the grower extra work. Such markings are a very definite aid to both buyer and seller, and growers should not need reminding that once having established a sound reputation in the markets a grower's fruit is very often sold on the markings alone. Unless he is ashamed of the contents, one of the grower's first considerations should be clear and legible markings on the case.

A distinctive and well-designed label is the best and most practical way of presenting the necessary markings, as a distinctive label has a certain amount of sales value in itself, provided that the fruit is up to standard, but if labels are not available the grower can at least see that any stencilling or stamping done is neat and easily decipherable—smudging of the work should be avoided and any abbreviations should be those in standard or common use.

Grading and packing have deteriorated probably more than most other pome-fruit growing operations during the war years, due in most cases to the extreme shortage of skilled operators and materials, but it is to the credit of the majority of growers that they did their best to keep up the standard.

Standards will be Higher in Future.

The extreme shortage of apples apparently made buyers prone to overlook a sometimes high percentage of superficial blemishes and codling moth infestation, badly bruised fruit and slackly packed cases, but it is only reasonable to expect that they will show much more discrimination when supplies are more plentiful.

The grower who, by attention to his cultural methods, can produce good quality apples of the varieties and sizes in popular demand, and follows this up by conscientious grading and packing—in short, the man who gives a fair article for a fair price—should have little to fear from any competition. On the other hand, the grower who imagines that he can induce buyers to give a high price for an inferior article, once supplies become more plentiful, as they undoubtedly will in the near future, is merely hoodwinking himself to his own detriment and to the detriment of the industry in general.

Armillaria Root Rot—*continued from page 67.*

broken jet delivered at an angle—proved more effective than a straight jet from the rod without the nozzle, for blowing soil and water from excavations.

Recently officers of this Department in the Gosford district showed that crown root baring could be efficiently carried out by using an air blast provided by an air compressor. Unfortunately air compressors are not readily available, whereas the reverse applies to motor spray outfits.

It is desired to thank Messrs. J. Hutchinson & Son and Mr. J. Hutchinson of Glenorie for their assistance and for making trees and plant available.

POTASSIUM DEFICIENCY IN COASTAL SOILS.

A Cause of Decline in Citrus and Passion Fruit.

R. H. ARNOT, B.A., B.Sc.Agr., Analyst.

A CONDITION of decline of orange trees and passion fruit vines in the Gosford and Moorlands districts, accompanied by highly characteristic symptoms in the leaves and twigs, has been shown to be associated with abnormally small amounts of potassium in the tissues. Field trials with potash fertilizers have shown promising results, and the characteristic symptoms have been reproduced in young orange trees deprived of potash under experimental conditions.

This condition, which is generally called "burnt leaf," has been the cause of considerable concern to orange growers in the Gosford and Moorlands districts. It became widespread in the spring of 1938, and has since appeared rather irregularly, being much worse in some seasons than in others.

Symptoms.

Generally the disorder occurs in orchards on grey sandy soils, and usually in low lying situations. The symptoms are most prominent in spring. Affected trees produce a rather weak new growth with small pale leaves, and this commonly dies back before reaching maturity. This die-back characteristically starts at the base of the twig. At one side, about ½ inch above its attachment to the previous season's growth, a brown dead area develops; this spreads around the base of the twig, which collapses and dies.

At the same time the mature leaves also show symptoms. Characteristically they turn a rather bright yellow, commencing at the tip, and then brown off so that at one stage the leaf is green at the base and brown at the tip with a yellow band in the middle. This leaf symptom is much more marked on the sunny side of the tree. At other times of the year the tree presents a poor and bunched appearance, with numerous dead twigs and dull leaves, whilst crops of fruit are very light. In bad cases the tree may be nearly defoliated.

Early work showed that the condition was not associated with any pathogenic organism, but analysis of affected leaves and green mature leaves from affected trees showed that the amount of potassium present was small—on a dry weight basis, generally less than 0.2 per cent. and sometimes less than 0.1 per cent., compared with about 0.25 to 1 per cent. for mature leaves from healthy trees. The initial leaf analyses were carried out by Dr. N. H. Parbery, Analyst, Department of Agriculture.

The symptoms shown by mature leaves resemble those of potassium deficiency obtained by Haas[1] in sand culture. Chapman and Brown[2] described weak laterals with a yellow area on the bark near the main stem in experimentally produced potassium deficiency, but in their experiments the yellow area became green again.

The Condition Produced Experimentally.

As the characteristic type of twig dieback associated with a basal necrosis did not appear to have been observed previously, either in the field, or in culture, a series of sand cultures was set up in an attempt to reproduce it under conditions of experimentally produced potassium deficiency. Clean washed river sand was used in glazed earthenware pots each containing 30 lb. sand. One-year-old Washington Navel orange trees on rough lemon stock were planted in these pots in early spring, after being severely pruned and having had all earth carefully washed away from the roots. The trees were watered with solutions containing plant nutrients in soluble form, the following treatments being given to lots of six trees:—

(1) Trees supplied with all necessary plant nutrients (control).

(2) Trees deprived of potash, with high calcium concentration.

(3) Trees deprived of potash with sodium partly replacing calcium.

Treatment 3 was included to discover whether varying the ratio of calcium to potassium induced variation in symptoms (Haas[1]).

The trees deprived of potash grew as well as the control trees for some time, but very distinctive symptoms of potassium deficiency were obtained the second spring after planting. During the spring and early summer, weak laterals were produced, many of which soon died. In some cases a necrotic spot appeared on one side towards the base of the shoot, and extended around it, leading to wilting and death. At the same time the mature leaves yellowed, became scorched and then were shed. Sometimes they yellowed and then browned off from the tip, but the symptoms often developed more irregularly. Many leaves became puckered, and a severe gummosis developed in the main stem of several trees.

In the early part of the experiment the symptoms seemed worse in the trees receiving a high concentration of calcium than in those receiving sodium, but no difference was noted in the later stage.

The burning of leaves and necrosis of twigs closely resembled the field symptoms of "burnt leaf," but the puckering of leaves and gummosis which occurred in the sand culture are not field symptoms of the disease.

The trees which received potash grew satisfactorily throughout the experiment and showed none of the above symptoms. Analysis of leaves from the various treatments showed that the trees deprived of potash had about 0.2 per cent. of potassium in the leaves, whilst those receiving potash had a high concentration, about 2 per cent., as shown in the table below :—

Treatment	Potassium Percentage (Dry Weight Basis).	
	1½ Years After Planting.	2½ Years After Planting.
Control	2·41	1·71
No potassium, calcium high	0·19	0·22
No potassium, calcium low	0·22	0·22

Thus the symptoms of experimentally produced potassium deficiency resembled closely the field symptoms of "burnt leaf," and leaves from the trees deprived of potash contained about the same amount of potash as leaves from trees affected by "burnt leaf."

Effect of Potash Applications in the Field.

Small trials with potash fertilizer were laid down on a property at Ourimbah. A single row of nine trees in a block of Valencias about eighteen years old that had suffered severely from "burnt leaf" for several years, was given heavy dressings of potash between February, 1944, and June, 1945 — a total of 13 lb. muriate or sulphate of potash to each tree.

Twig Produced by Orange Tree Suffering from Potash Deficiency.
Note brown dead area near the base on the twig.

Samples of leaves collected in July, 1945, showed that the treated trees had absorbed large amounts of potash. The leaves contained 0.67 per cent. of potassium compared with 0.27 per cent. in leaves from untreated trees two rows removed from the treated ones. At the same time the fruit from the treated trees seemed somewhat larger and

more uniform, and yellowed and scorched leaves seemed distinctly less frequent on the treated trees than on the untreated. However, the trial was not continued as it was not statistically laid out.

Decline in Passion Vines.

Decline of passion fruit vines, accompanied by yellowing and scorching of the leaves, was observed at Moorlands and Mangrove Mountain during 1945. Analysis of affected leaves showed that leaves from affected vines contained 0.2 per cent. to 0.3 per cent. of potassium, compared with 0.5 per cent. to 0.9 per cent. in leaves from nearby healthy vines. A small trial at Kulnura using potash has given promising results.

References.

[1] HAAS, A. R. C., 1936: *California Citrograph*, 22: (1), (2).

[2] CHAPMAN, H. D. and BROWN, S. M., 1943: *Soil Science*, 55: 87-100.

Contour Planting of Fruit Trees.

IN the planting of new orchard areas the mistake is frequently made of concluding that because the area in question has not shown signs of washing in the past it will not do so in the future.

Areas which have previously been under pastures, and even ground which has been cropped with cereals, etc., for many years and has shown no signs of washing may, when planted with fruit trees and continually cultivated, quickly show small washes, especially in cut-outs made by the ploughs, wheel tracks, etc. These miniature washes, which at first are hardly noticeable, will increase in depth and width unless they are attended to, until, as is to be found in many of our older hillside orchards, they quickly develop into gullies and creeks, and are a constant menace. The orchard gradually becomes washed out and valueless when, in reality, it should be in its prime.

No system of contour banking on old orchards, or contour planting of young orchards, will prevent soil erosion altogether. All hillside orchards must wash to a more or less extent; but by a proper laying out of orchards or vineyards on the contour system all serious soil erosion can definitely be eliminated, and the gradual sheet erosion, which must necessarily take place, will be reduced to a minimum.

Cleansing of Dairy Utensils.

UNCLEAN dairy utensils are probably the most common cause of cream contamination. In washing and sterilising them, the best results are obtained when the operations follow the following routine:—

1. Rinse away all milky material with lukewarm water.
2. Thoroughly scrub each utensil with a brush and water which contains soap or soda or both soap and soda. The water should be hot, but not so hot as to be uncomfortable to the hands.
3. Rinse in warm water.
4. Place in boiling water for 2 or 3 minutes.
5. Drain and place in an airy position to dry quickly.

Hypochlorite solution is the most satisfactory steriliser for washing the hands or the teats and udders.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Newcastle (P. G. Legoe)	February 19, 20, 21, 22
Queanbeyan (D. Vest)	February 21, 22
Walcha (T. C. Bath)	February 25, 26
Dorrigo (W. Tomlinson)	February 27, 28
Bega (Jas. Appleby)	Feb. 27, 28, March 1
Tumut	March 4, 5
Jingellic (A. G. McVean)	March 5
Gulgong	March 12
Castle Hill (Patricia McMullen)	March 14, 15
Blayney (K. Gresser)	March 18, 19
Warialda (L. Rolfe)	March 18, 19
Camden (G. F. Sidman)	March 20, 21, 22
Sydney R.A.S. (G. C. Somerville)	Mar. 29 to Ap. 9
Bellingen (C. P. Franey)	April 22, 23
Grafton (C. W. Creighton)	April 24, 25, 26
Walbundrie (C. Leischke)	October 1

Fruit Growing.

CAN POULTRY HELP IN THE CITRUS ORCHARD?

Advantages and Disadvantages Discussed.

E. C. LEVITT, H.D.A.,
Fruit Instructor.

Poultry in Colony Houses in a Block of Valencia Oranges.

MANY citrus growers ask the question, "Can poultry help in my orchard?" Generally the answer is "Yes", provided certain safeguards are taken. In the case of oranges, lemons and grapefruit, considerable benefit can be expected, but with Emperor mandarins the combination is an unhappy one, resulting in a marked reduction in fruit quality.

The citrus grower using poultry in his orchard can expect to derive the following advantages if his management is based on sound lines:—

1.—*Improved tree vigour and cropping*, due to better retention of soil moisture as a result of more efficient weed control during the warm weather.

2.—*Lower Cultivation Costs*.—As the weeds are controlled largely by the birds, frequent summer cultivation is unnecessary and chipping is largely eliminated.

3.—*Soil Erosion Losses are Checked*.—In the absence of frequent cultivation there is little loose surface soil to wash or blow away.

4.—*A Useful Supplementary Manure Supply*.—The poultry manure obtained will prove a handy supplement to the normal fertilisers.

Disadvantages Discussed.

The practice of running poultry in the citrus orchard is not without its disadvantages, and these should be carefully studied prior to embarking on the scheme.

The main disadvantages are:—

1.—Scale pests tend to increase when poultry are run in the orchard—in the manner often noted on trees subjected to road dust; trees near the poultry houses are the chief sufferers in this respect. Special attention must be given to scale control.

2.—Poultry constitute a tie which may well prove irksome. They cannot be left unattended for even short periods.

3.—The daily attention required by the birds will necessitate a change of management programme which, at times, may create difficulties.

4.—Some interference to mechanical orchard operations may be encountered. This can be a serious drawback if the poultry layout is not well planned.

It may be well to discuss some of these disadvantages before proceeding further.

The trees under which the birds dust bath are invariably more prone to scale infestation. Such trees are usually found close

to the houses. The rate of stocking has a bearing on this aspect—the more birds per acre, the more dust and the more trees likely to become severely infested. Special attention to scale control must therefore be given.

Probably the greatest disability is the fact that someone has to be on the property every day. Provision must be made for attention to the poultry, no matter how busy you may be in the orchard. Matters such as egg collection and food and water supply must be given daily attention. The labour involved may be reduced to a minimum by careful lay-out planning, use of dry mash feeding and provision of an automatically regulated water supply.

Interference to the operation of mechanical equipment can be a serious drawback if the lay-out of the yards is faulty. Make the yards as large as possible and provide gates sufficiently wide to permit the free movement of vehicles and implements.

Summer Weed Control.

So much for the disadvantages. On the other hand we find that the summer weed control given by the birds without constant stirring of the soil, results in the maximum retention of soil moisture with a consequent improvement in tree vigour. Irrigation should be practised in dry weather.

A stocking rate of 50 to 75 birds per acre will, if well distributed, provide summer weed control in shallow soils. Up to 150 may be necessary in deeper soils. In wet seasons the control will not be as efficient as in dry times and, in this case, some cultivation will be necessary. This also applies when weeds unpalatable to the birds become established.

If nut grass or some other deep rooting perennial is present, a heavy stocking rate may be required for the first three years. In such cases the object is to prevent weed growth at all times of the year until the offending plant is eliminated.

The Use of Cover Crops.

It is usually desirable to sow cover crops in the autumn which, with the aid of autumn and winter rains, provide a fair to good cover during the cold weather if the stocking rate is normal. This crop is turned in by ploughing or discing late in the winter—leaving the tree squares and occasional plants to be dealt with by the poultry. Subsequent cultivation will be dependent on the weather and the ability of the birds to handle the weed growth.

Any of the recognised green manure crops may be used, but a grain and legume mixture is possibly the most desirable. Provided manurial dressings are adequate legumes may be omitted. While it is desirable to move the birds from the area to be sown, it is not always practicable to do so, and in such cases their presence may be ignored. In such cases the poultry will prevent growth in the vicinity of the houses, but an adequate crop will be obtained elsewhere provided moisture requirements are met. Should dry weather follow the planting then the control exercised by the poultry on the crop will assist the trees.

Loss of soil by erosion is lessened in poultry yards because of the firm soil surface. This surface will be a problem on slopes, as the rapid run-off is unfavourable to moisture penetration. The answer lies in providing contour banks or furrows. A shallow basin arrangement of soil under the trees also helps considerably.

Value of the Poultry Manure.

Poultry manure can be used to advantage on all citrus varieties except Emperor mandarins. It has been estimated that the droppings of three birds will supply one tree's requirements. This would require a stocking rate of about 300 birds per acre, a rate that should never be used except when elimination of a weed such as nut grass is the objective—and then only for a long enough time to achieve this purpose.

A high stocking rate results in larger crops of poor quality fruit, together with more difficulty in achieving satisfactory pest control. Therefore the usual fertilising programme should be adhered to and the poultry manure used as a supplementary dressing. Endeavour to equalise the application by distributing manure from the houses to the parts least frequented by the birds.

Very high stocking rates have been known to result in the death of trees, especially in shallow soils. The practice of tree roosting will cause damage to the trees by limb injury and an over-supply of manure. This practice must be checked continuously.

The Position Summarised.

It is necessary that the poultry pay their way if the benefit to the orchard is to be economical. Similarly the orchard side must not be neglected. The ideal combination is to keep just sufficient poultry to ensure summer weed control in normal seasons, and no more.

Summarising we find that poultry in the citrus orchard assist in:—

1.—Reducing cultivation costs.

2.—Improving tree vigour and cropping.

3.—Reducing soil loss by erosion.

4.—Augmenting the manure supply.

5.—Elimination of weeds such as couch and nut grass.

Disadvantages of the combination are:—

1.—The birds constitute a tie to the property, needing constant attention.

2.—Scale pests tend to increase.

3.—Tree roosting will cause damage if not prevented.

4.—When used with Emperor mandarins, birds adversely affect fruit quality.

Remember that:—

1.—Poultry must be run to benefit the orchard, and not *vice versa*.

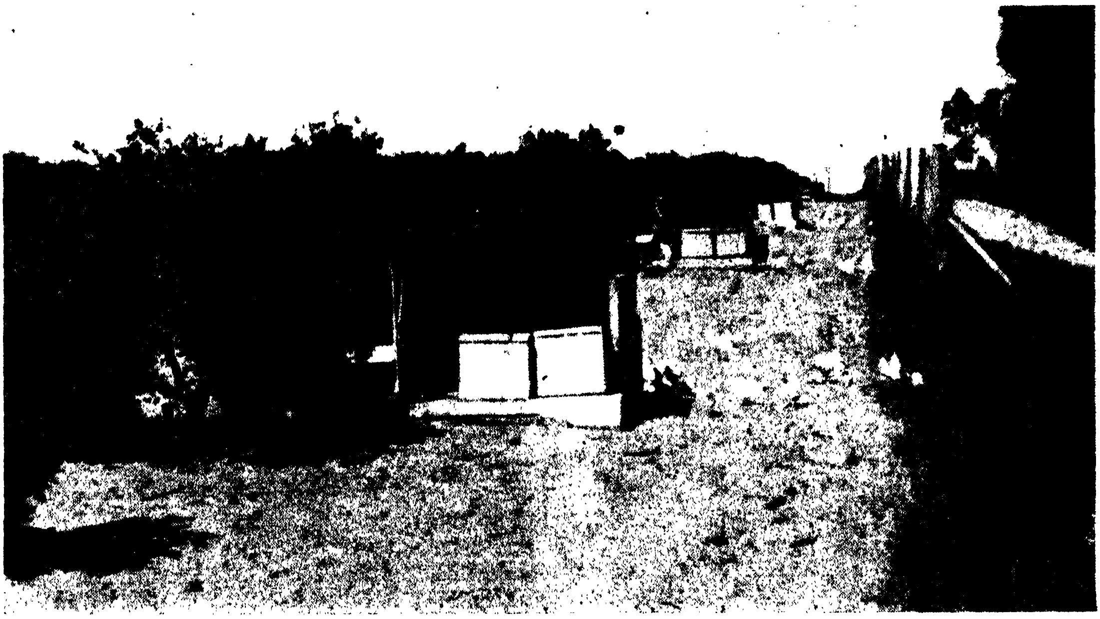
2.—The birds must pay, or their help becomes too costly.

3.—The lay-out must be planned to minimise interference with orchard operations.

4.—Over-stocking must be avoided—otherwise fruit quality will be affected.

5.—On slopes, provision must be made to check excessive run-off by means of contour banks and tree basins.

6.—Pest control measures must be efficient.



Colony Houses on Headlands of a Citrus Orchard.

APPLE GROWING IN NEW SOUTH WALES.

(*Continued from page* 25.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

IN continuation of this article the authors discuss the management of soils in apple growing districts, making mention particularly of control of soil erosion, maintenance of fertility, methods of cultivation, soil moisture requirements and the growing of cover crops.

Soil Management.

The aim of all soil management practices should be the maintenance of soil fertility at as high a level as possible. Upon the success achieved depend the health, longevity and productivity of the trees. The importance of correct methods of soil management from the inception of the orchard cannot be stressed too much.

There are two main aspects to this maintenance of soil fertility—the conservation of the soil itself by preventing erosion and the maintenance and replenishment of the soil's humus content. Control of soil erosion is a major problem, but on land not particularly subject to erosion, soil fertility can be seriously reduced—for instance, by depletion of the humus content and upsetting the physical condition of the soil by excessive cultivation.

A Cut-away Disc Harrow.
This implement is excellent for orchard cultivation; it chops up and incorporates weeds and cover crops, and leaves the soil surface in good rough tilth.

Loss of soil by erosion can be guarded against by planting the trees on the contour and practising less intensive methods of cultivation than were common in the past. The young apple orchard planted on the contour has a good foundation for a programme of protection against soil erosion, but it should always be remembered that the mere planting of the trees in contour rows has no influence on checking the run-off of surplus water. Plough furrows and implement tracks along the contour rows carry off the water across a moderate slope. The land should never be worked up and down the slope, and on steeper sites, contour banks should be constructed at intervals down the slope.

In established orchards the degree of erosion should determine the control measures to be adopted. In some cases erosion may be serious enough to justify the construction of contour banks, but the orchardist should realise that, in a square-planted orchard, such banks can save the soil only if unremitting care is taken to keep them in good order—otherwise they can become a menace rather than an asset.

In less serious cases erosion can be checked by avoiding excessive cultivation, maintaining a reasonably rough tilth during the growing season, directing all cultural operations across the slope instead of up and down, by the use of cover-crops or by strip cultivation amongst young trees.

Cultivation and Soil Moisture.

Fortunately the harmful effects of the excessive cultivations once so commonly given to achieve "clean cultivation," are becoming more generally appreciated. The theory that frequent cultivation is necessary in order to form a fine soil mulch (at one time considered essential to hold the soil moisture), was long ago exploded. It is now recognised that so far as orchards are concerned, the major benefit of cultivation lies in the control of excessive weed growth during the growing season when such weeds are competitors with the trees for the available soil moisture.

Actually the frequent tillage of the soil does a great deal of damage eventually to the physical structure of the soil—as the result of the destruction of soil humus.

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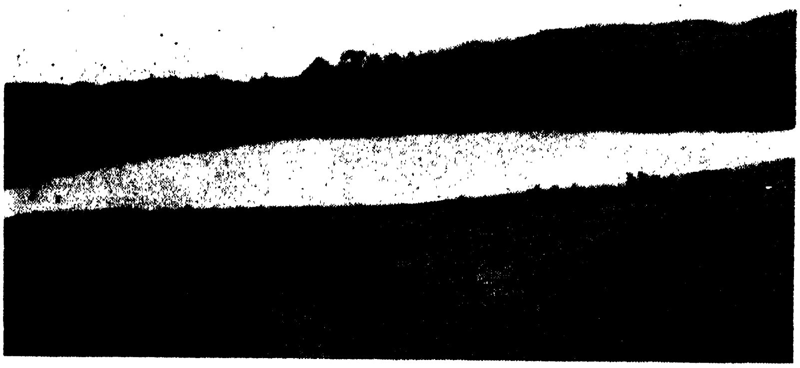
Present-day methods of orchard cultivation provide for the use of implements which maintain a moderately rough tilth, are capable of covering the whole orchard in a reasonably short time, and are effective in checking weed growth.

In some of the lower rainfall areas, control of weed growth in the spring and summer months is imperative. Apple trees in marginal areas, where the rainfall averages little over 20 inches, may, in a season a little better than average, produce reasonably good marketable crops, but generally such a rainfall is insufficient to ensure reasonable continuity of cropping even without any competition from weeds. A few inches of water at the right time may mean all the difference between a payable and non-payable crop, and hence the logical thing to do, if possible, is to supplement the natural rainfall.

A Water-storage Dam in the Batlow District.

Holds approximately 4,000,000 gallons, and can be used for limited irrigation by gravitation.



Seriously Eroded Orchard Land.

The result of continual mismanagement of the soil.

As a source of income this orchard is failing fast.

Storage of water in small schemes by individual growers or groups of growers is a practical possibility in many localities. The limiting factors are the costs of storage and of application, which vary greatly according to the availability of good sites. This suggestion is made, not with the idea of recommending apple growing in low rainfall areas, but as a means of making the best of at least some of the areas already planted on good sites when the rainfall is hardly sufficient for the purpose.

The method known as "sod culture" often comes up for discussion amongst apple growers. Sod culture as practised in other parts of the world usually entails more or less total stoppage of cultivation. This is offset by certain measures, such as heavy applications of artificial fertilizers, mowing excess growth and leaving it to rot, applica-

tion of irrigation water when necessary, etc., according to the locality.

However—except as a last resort in certain cases of soil erosion—sod culture does not appear from experience to date to have anything to recommend it under our conditions of somewhat erratic summer rainfall.

Cover Crops.

Organic matter plays an all-important part in the maintenance of soil fertility. In its virgin state most of our good class apple growing land is, or was, of good crumbly structure, plentifully supplied with organic matter.

A Cover Crop of Subterranean Clover and Trefoil at Batlow.

Crops of this type enrich the soil and are first-class insurance against erosion.

Under any system of continued cultivation it is difficult to check losses of humus from the soil, and with this in mind, every effort should be made to maintain and if possible increase, the humus content of the soil. Fortunately this can be done economically in most of our apple areas by growing and turning in green manure crops, preferably of the leguminous type such as the clovers, peas, beans, vetches, etc. Of these, the self-seeding clovers, such as Subterranean, have proved to be particularly valuable in the districts suited to them, and in fact Subterranean clover is now regarded in many places, especially the higher rainfall areas, as a soil builder without equal.

However, all the legumes are valuable as soil builders because they use less of the nitrogen in the soil in their growth and decomposition than do other plants, and thus, as their value as humus-forming material and as a guard against erosion is high, they obviously are ideal for the purpose.

However, if it is impossible to grow a leguminous crop, barley, oats, rape and even a volunteer weed crop, can be most useful sources of organic matter and cover for the soil. In fact, in the areas of less reliable rainfall, the volunteer weed crop, top-dressed in the autumn with superphosphate, is frequently the most satisfactory and economical source of added organic matter. It should always be remembered, however, that if a cereal crop is used for green manure, it is imperative to turn it under whilst still in the young and succulent stages. With all cover crops an application of superphosphate in the autumn is essential, especially with clover.

Growth of the cover crop should continue undisturbed until the spring, but it should be ploughed or disced in well before the tree-blossoming period if possible, to obviate competition with the trees for moisture and plant materials during this critical period.

It should also be kept in mind that the humus content of the soil determines to a large extent the moisture absorptive and retentive powers of the soil. A high humus content is therefore particularly important under our conditions where, in most cases, the natural rainfall is depended on for soil moisture supplies.

(To be continued.)


Shaping a new world..
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INSECT PESTS.

Notes contributed by the Entomological branch

The Potato Moth *(Gnorimoschema operculella)*.

THIS insect is present in every potato-growing district in New South Wales and the caterpillars or larvae may cause considerable damage to the foliage and stems in the early summer, particularly in the coastal areas, and may so injure the tops of the plants that they die prematurely, thus causing considerable loss in yield.

A much more serious form of injury, however, may be caused to the tubers, both while growing and during storage. Damage to the tubers in the field occurs when they become exposed, due to cracking of the soil caused by the combined effects of the expansion of the tubers, and the drying out of the soil. Loss also occurs if the tubers are allowed to remain in the field for any length of time after harvesting.

In districts where the rainfall is low, temperatures high and the ground is liable to crack, severe losses may always be expected, but in friable, self-mulching soils, and where a good rainfall is experienced, little loss occurs.

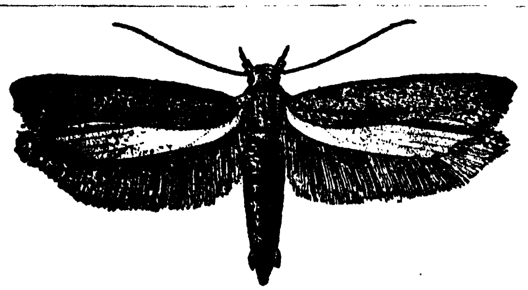
Description and Life-history.

The adult moth, which measures about ½ inch across its outspread wings, is of a general brownish-grey colour, with minute, scattered, darker markings on the fore-wings. The moths are not readily noticeable in the fields during the day owing to their habit of hiding amongst clods and rubbish at that time. Their protective colouration also renders them difficult to detect. At dusk, however, they may be seen actively flying about.

Egg-laying commences about two days after the moths emerge, and in the field the eggs are usually laid on the undersurfaces of the leaves. During the summer they hatch in five or six days, but during the spring and autumn the incubation period may be as long as fourteen days.

The very small caterpillar or larva, on emerging from the egg, may crawl about for a while on the leaf, but soon commences to mine or tunnel into the leaf tissues, causing a characteristic "blistering." As the larva grows it eats its way into the leaf stalk, and eventually may make its way into the main stem, and by working downwards, causes the terminal section to die.

The fully-fed larva, which measures about ½ inch in length, has a dark-brown head and a pinkish-grey, or, if feeding in the leaves, greenish-tinged body. The larval period occupies about fourteen days during the summer, but much longer during the colder months. When fully-fed the larva leaves the plant and shelters beneath a clod or amongst plant refuse on the ground, and there spins a silken cocoon, within which it enters its pupal or chrysalis stage.

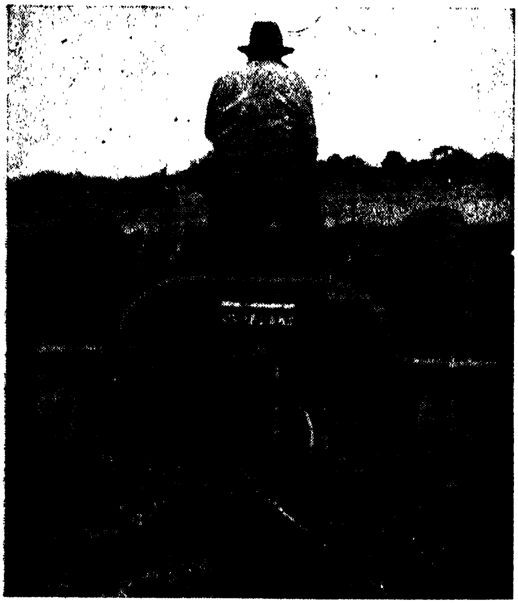


The Potato Moth. [After Graf.

During the summer, the life-cycle, from egg to adult, occupies about four weeks, but during the colder months may be greatly prolonged.

Several generations occur during the year, and in the cool tableland areas, potato moths may over-winter in their pupal

stage within their cocoons; in the warmer coastal districts, however, moth activity continues throughout the winter, although more



The Disc Hiller, with the Discs Out of the Ground.

slowly, on "volunteer" potato plants and tubers left lying about the ground, and also on weeds related to the potato, such as the nightshades (*Solanum nigrum* and *S. pterocaulon*), thorn apple or false castor oil plant (*Datura stramonium*), and the false Cape gooseberry (*Nicandra physaloides*).

Where infestation occurs during storage, the eggs are laid in the eyes of the tubers, in scars or cracks, or under loose pieces of skin, and hatching takes place in four or five days in summer.

These larvae usually enter the tubers through the eyes and tunnel throughout the potatoes, filling the tunnels with excrement and permitting the entry of decay organisms, and, unless checked, may eventually reduce the tubers to a decaying mass. When fully-fed, these larvae spin their cocoons in any sheltered situation, particularly where two tubers are in contact, on the sides of the bags, etc. During storage, breeding may go on continuously, except in very cold weather.

CONTROL MEASURES.

Control of Foliage Infestation.

Infestations in the foliage may be controlled by using a spray or dust containing D.D.T. This chemical has been found to be extremely effective, both in preventing foliage injury and in obviating further damage where the infestation has become quite extensive.

The dust should be used at a concentration of 2 per cent. D.D.T., and the spray at a concentration of 0.1 per cent. D.D.T.

Where growers have reason to fear heavy foliage infestation early in the growth of the crop, and consequent risk of destruction of the crop, dusting with 2 per cent. D.D.T. at the rate of 30 to 40 lb. per acre will give almost complete protection of the foliage for a period of fourteen days, after which a second application may be necessary.

Machines are now available which can dust 2 to 3 acres per hour.

If, by dusting, the moth caterpillars developing in the foliage, can be kept continuously, to very small numbers, it may be expected that there will be little loss of tubers at digging time. However, dusting for this purpose has many disadvantages and is not considered to be justifiable, economically, in view of the cheap and thorough control that can be obtained by hilling.

Side View of Tractor, showing Attachment of Fourth Disc of Hiller.

Hilling and Deep Planting.

The best means of preventing infestation of the tubers is to hill thoroughly, late in the growing period, when the potatoes are commencing to swell to a large size, but before they commence to crack the ground.

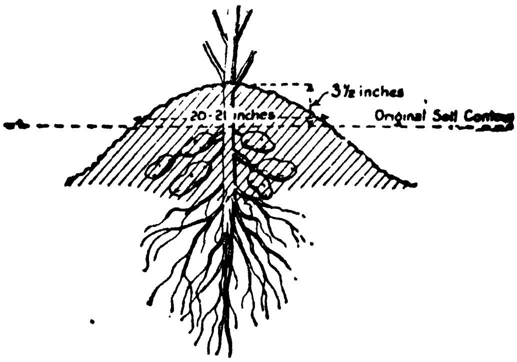


Diagram showing Type of Hill to be Aimed at.
Such a hill is broad and rounded in cross section, with the soil drawn well round the bases of the plants so as to fill in the cracks.

The rows should be widely spaced, not more than twenty-four to the chain, so that a wide and large hill is obtained, and less injury caused to the plants.

The time to hill will vary with the season. It will be earlier in a good growing season than in an adverse one. Usually, a crop planted about the end of November should be hilled at the end of February, or early in March.

Hilling, to be effective, must be thorough. The soil should be thrown well up around the bases of the plants, and this is best done with a disc-hiller.

The four discs, attached to a tractor, can hill two rows of plants at once and can cover about 20 acres per day.

Where hilling cannot be done satisfactorily, deep planting, to a depth of at least 6 inches, is useful in minimising the loss of tubers.

Rotation of Crops.

It is considered that the reason why this pest has become so destructive in recent years is that potato soils have become depleted of humus or organic matter, with the result that they dry out and crack quickly in dry weather. Every effort should be made to maintain the humus content of the soil by a proper rotation of crops, including the use of short term pasture plants and clovers, and by only growing potatoes in any particular area of land, every five or six years. Growers should seek the advice of their local agricultural instructor regarding the best rotation, so as to replenish the humus content of their potato land.

Rotation is necessary for another reason, namely, that it is invariably found that the potato moth appears earlier, and its damage is greater, in areas where potatoes were grown the previous year. It is considered to be undesirable, therefore, to grow potatoes on the same land two years in succession.

Clean Cultivation.

The fact that the potato moth can over-winter on weeds allied to the potato, as previously stated, and on self-sown potato plants, emphasises the need for removing as many rejected tubers from the land as possible, and keeping the ground free from such weeds and self-sown potato plants. This will reduce the numbers of the pest that "carry over" to the next season, particularly in the warm coastal areas.

Harvesting.

The tubers should be bagged and the bags sewn and removed from the field as soon as possible after digging, especially in warm

Young Potato Plant showing Damage to Leaves and Stems Caused by Potato Moth Caterpillars.

sunny weather, as heavy infestation may occur between the time the tubers are taken out of the ground and their removal from the field.

Potato tops should never be used to cover the bags while they are standing in the field, as moths and larvae may thus be introduced into the bags.

Potato showing Internal Damage Caused by Potato Moth Caterpillars.

Protection of Seed Potatoes.

Seed potatoes may be completely protected by dusting them thoroughly with a 2 per cent. D.D.T. dust, using about ¾ lb. per bag. Experiments in progress indicate that the concentration of D.D.T. in the dust may be considerably reduced and still prove effective.

It is worthwhile to dust moderately infested seed potatoes, as, although dusting may not kill all the larvae which are feeding in the tubers, it will prevent any further breeding and further damage.

Usually it is not necessary for tableland growers to dust their seed between the months of May or June and October, as the cold weather acts as a natural check to moth development, but seed dug during March or April should be dusted. In coastal areas, it may be necessary to dust stored seed at any time of the year if it is infested or likely to be infested.

Grub-infested Seed May Be Planted.

Growers are sometimes in doubt as to the advisability of planting seed which is, or has been infested with potato moth caterpillars, but seed which is quite heavily damaged may be planted, provided one or more eyes are intact. Naturally, if all the eyes are eaten out, the tubers will fail to "strike."

Precautions, however, should be taken against planting infested seed in isolated areas where potatoes are being grown for the first time, and where the potato moth may not be present.

Protection of Table Potatoes.

D.D.T. is not recommended for dusting table potatoes as there is a possibility that the residue on dusted potatoes may be harmful to persons eating the potatoes, and also there is a risk that the D.D.T. may impart a taint to the tubers.

Table potatoes may be protected from infestation by dusting them thoroughly with a derris dust. Although this dust usually has no effect on the flavour of the potatoes, it is preferable, first, to dust only a small quantity, store them for two or three weeks, and then cook them. If no taint can be detected on tasting them, then the bulk of the potatoes may be dusted.

Infested table potatoes may be fumigated with carbon bisulphide in an airtight container, using 2 lb. of carbon bisulphide (24 fluid oz., *i.e.*, 1 1/5th pints) to every 1,000 cubic feet of air space in the container. The liquid may be poured, either into a shallow tray or on to a sack placed on top of the potatoes. The opening to the container should then be closed and any cracks sealed by pasting strips of paper over them. The gas given off, which is heavier than air, should be allowed to act for forty-eight hours. After fumigation the potatoes should be aired and placed in a moth-proof place, as the fumigation will not protect them from later infestation.

WARNING.—Carbon bisulphide is highly inflammable and explosive, and no light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near the sheds or buildings during the process of fumigation with this chemical. The precaution should also be taken of cutting off the electric current. Even hot steam pipes have been known to cause explosion of this gas, and, therefore, the steam should be cut off and any such heated pipes allowed to cool before proceeding with fumigation.

Control of French Bean Fly.

Experiments with D.D.T.

P. C. HELY, B.Sc.Agr., H.D.A., Entomologist.

EXPERIMENTS conducted in the Gosford district in the autumn of 1946 showed that sprays containing 0.05 per cent. of D.D.T. offer a very promising method of control of French bean fly (Agromyza phaseoli), when applied at similar intervals to the nicotine sulphate-white oil sprays at present recommended. Their cost is lower, they are easy to mix, and they are safe to apply.

Since Morgan[1], in 1937, demonstrated that satisfactory control of French bean fly could be obtained in autumn crops of French beans by the application of sprays of nicotine sulphate and white oil, this method has become standard practice in those areas subject to the ravages of the pest. From three or four up to eight or nine sprays may be applied, depending upon the incidence of fly infestation, but generally speaking the method is very successful and enables beans to be grown profitably in areas which could not otherwise be safely planted to this crop.

The principal disadvantages of the method are the rather extensiveness of the spray programme itself, the high cost of nicotine sulphate, and in addition the tendency of the spray combination to cause leaf scorch under some conditions, and to reduce the cropping capacity of the beans if too many sprays containing white oil are applied.

During the autumn of 1945 some preliminary trials[2] indicated that D.D.T. emulsions gave promise of being an excellent substitute for the nicotine-oil mixture, as a 0.1 per cent. D.D.T. spray gave almost complete control of maggot infestation in the stems.

In the course of experimental work on other bean pests during the following spring, however, it became rapidly apparent that the application of D.D.T. sprays was shortly followed by a very considerable increase in the red spider infestation.

In February, 1946, an experiment was commenced at Gosford with the general aim of ascertaining the value of D.D.T. sprays at two different concentrations and applied according to the recommended schedule for nicotine sulphate-white oil spraying, and to compare these with the standard method. With the problem of red spider also in mind a mixture of D.D.T. emulsion and lime-sulphur was included in the experiment and also a dust mixture containing D.D.T. and sulphur.

In addition to exploring the possibilities of D.D.T. containing materials, some modifications of the nicotine sulphate programmes were also tested. These included nicotine sulphate spray and also a combination of nicotine sulphate and sugar.

Whilst the recommended programme of nicotine sulphate-oil gives satisfactory control of stem infestations up to blossoming, very severe branchlet injury may occur after spraying ceases. Insectary tests have shown that nicotine-sugar bait sprays are rapidly toxic to bean flies, and this method appeared to offer promise in breaking down the heavy population of flies. Some field observations on this practice had appeared to have had this result, and this combination was therefore introduced into the experiment to determine if the addition of sugar reduced the efficiency of the nicotine, and also the general worth of this method of control.

Description of the Experiment.

A crop of Hawkesbury Wonder beans, approximately half an acre in extent, sown on 5th February, was selected for the experiment and eight treatments were replicated eight times in 14 yard sections of three rows each, in the form of a latin square.

The appropriate plots were treated by means of knapsack spray or dust equipment, and the sequence of applications was similar on each occasion, so that the actual time intervals between treatments were uniform. The beans were showing through the ground on 11th February and treatment was commenced on 15th, following rain on

12th and 13th, and six subsequent treatments were given on 18th, 21st, 24th and 27th February, and on 2nd and 6th March, concluding one week before blossoming.

Flies were numerous at the commencement and throughout the experiment, and self-sown bean plants outside the cultivated area rapidly succumbed to fly infestation and died off before they were more than about 6 inches high.

Weather conditions, from planting to the commencement of picking, were warm and fairly humid. The average weekly maximum temperature ranged from 88.4 deg. Fahr. in early February, down to 71.9 deg. Fahr. in March, whilst the average minimum temperature range was from 67.8 deg. Fahr. to 54.6 deg. Fahr. Over 9 inches of rain in eighteen falls occurred during the same period.

The Treatments.

The materials used were as follows:—

Nicotine sulphate: 40 per cent. Nicotine; pre-war stock.

White oil: 80 per cent. Hydrocarbon oil-mayonnaise emulsion.

Lime-sulphur: 20 per cent. Polysulphide sulphur.

D.D.T. emulsion A: 20 per cent. D.D.T. mayonnaise type.

D.D.T. emulsion B: 10 per cent. D.D.T. in solvent naphtha, cresylic acid emulsifier.

D.D.T. dust: 1 per cent. D.D.T., 40 per cent sulphur; 59 per cent. pyrophyllite.

Sugar: Raw, unrefined.

The following treatments were used in the experiment:—

A.—Nicotine sulphate, 1 fl. oz.: 4 galls.

B.—D.D.T. emulsion B, at 0.05 per cent. D.D.T.

C.—D.D.T. emulsion A, at 0.05 per cent. D.D.T.

D.—D.D.T. emulsion A, at 0.1 per cent. D.D.T. and lime sulphur 1:100.

E.—Nicotine sulphate 1 fl. oz., white oil 6 fl. oz., water 4 galls.

F.—D.D.T. emulsion A at 0.1 per cent. D.D.T.

G.—Nicotine sulphate 1 oz., sugar 1 lb., water 4 galls.

H.—1 per cent D.D.T. dust.

Method of Treatment.

The sprays and dusts were applied to the upper leaf-surfaces only. In all instances it was noticed that less material was used with the D.D.T. emulsion than with nicotine sprays, owing, no doubt, to the excellent wetting qualities of the former materials.

From 25 to 30 gallons of spray per acre were used in the earlier applications, while the final sprays took approximately 50 gallons per acre. The dusting rate averaged about 9½ lb. of dust per acre per application.

No injury, with the exception of a very slight leaf scorch in all treatments following a hot day, was observed throughout the experiments. Fusarium root rot was unfortunately prevalent from the commencement and plants continued to die off throughout the life of the crop. While this disease occurred throughout the area certain sections were more heavily damaged than others. No irrigation was practised, nor were the plants side dressed with fertilizer, but were kept well hilled by periodic scuffling between the rows.

Harvesting and Yields.

Picking commenced on 27th March and four subsequent pickings were obtained on 1st, 4th, 8th, and 17th April. The last picking was made during a period of torrential rain following which the bed was of no further value. At each picking the individual 3-row section plots were harvested and weighed separately. It was noted that there was a slight but general tendency for the D.D.T. sprayed plots to be a trifle later in maturing than the nicotine sprayed plots, but this is considered to have been due to the rather better condition of the plants in the D.D.T. sprayed plots. As picking proceeded it became evident also that the quality of the beans was better in these plots.

The following table summarizes the yield figures for the different plots and includes also the approximate comparative costs for

the different treatments, calculated on a per acre basis.

Treatment.	Yield.	Bushels per Acre.	* Cost of Materials per Acre.
	lb.		£ s. d.
A. Nicotine sulphate alone...	389	311	1 16 0
B. D.D.T. emulsion (B) at 0·05 per cent. ...	439	351	2 8 4
C. D.D.T. emulsion (A) at 0·05 per cent. ...	519	415	1 8 3
D. D.D.T. emulsion (A) at 0·1 per cent. and lime sulphur	494	395	3 3 0
E. Nicotine sulphate-white oil	466	373	2 10 0
F. D.D.T. emulsion (A) at 0·1 per cent.	469	375	2 16 6
G. Nicotine sulphate-sugar	407	326	2 15 0
H. D.D.T. dust	306	245	2 8 9
Difference necessary for significance.	72		

* The costs calculated in this table are based on the following retail prices of the different spray components.

D.D.T. emulsion (A): £2 9s. per gallon.

D.D.T. emulsion (B): £2 2s. per gallon.

Nicotine sulphate: £5 per gallon.

White oil: 6s. per gallon.

Lime-sulphur: 2s. 9d. per gallon.

D.D.T. dust: 9d. per b.

Effect of Treatments on Bean Fly Behaviour.

Morgan[2] has studied the effect of nicotine-oil mixtures on larval and adult bean fly behaviour, whilst the writer has made some similar observations in the case of nicotine-sugar bait spray mixtures. No opportunity has been available to make a similar study of the actual effects of D.D.T.-containing materials and an endeavour was made to determine this from field observations. Morgan determined by field counts and laboratory observations that the addition of white oil had a substantial repellent effect on adult flies. There has also been some suggestion of repellence noted with nicotine-sugar in the insectary tests where alternative unpoisoned baits were offered. To check up on any such possible repellent effects of D.D.T. materials, counts of adult flies were therefore made on plants in the centre row of each plot, approximately two hours after the completion of the first and second sprays. These counts are summarized in the following table:—

Number of Flies.

Treatment.	15th February, 1946.	21st February, 1946.	Total.
A	75	27	102
B	29	28	57
C	43	16	59
D	20	37	57
E	4	9	13
F	36	23	59
G	32	35	67
H	22	46	68

It is evident that of the materials used, only the nicotine-white oil combination (Treatment E) showed any appreciable repellent value. It is interesting to note, however, that the nicotine-sugar plots (G) were visited readily by the flies, although insectary observations had indicated that this material was repellent if alternative food was available. This would seem to indicate that, in the field, this alternative food factor is less important than has previously been thought to be the case. Whilst the nicotine-sugar sprays were not apparently repellent, there is no evidence to suggest that they are attractive and the fly population on these plants was not greater than on most of the other treatments. Flies seen on the spray-baited plants appeared to be feeding and such flies after a time became sluggish and could be picked up with the fingers. They easily lost their grip on the plant surface and fell to the ground, usually on their backs where their reactions alternated between coma and frenzied spasmodic movements.

No rapid effect on flies visiting the D.D.T.-sprayed plots was observed, though some evidence of flies becoming sluggish after a period of contact with such sprayed plants was seen. Stinging and egg-laying appeared to be normally prolific, but egg-hatching and larval development in sprayed foliage appeared to be diminished. During the period of application of the spray programme no evidence of maggot development was seen in the stems of plants sprayed with D.D.T., but after the cessation of spraying, some top infestation did occur, and some limited stem infestation also, but this was very small compared with the dusted and nicotine-sprayed plots.

Infestation in the main stems of plants in the nicotine-oil sprayed plots was evident, but not extensive.

No correlation, except in a general way, was possible for yield and degree of fly infestation. General observation did, however, indicate that yield was connected with the degree of stem infestation, which was obviously most severe in the dusted plants. The nicotine treated plots, with the exception of those in which white oil was included, showed a fairly heavy stem infestation, whilst those plants treated with 10 per cent. D.D.T. showed somewhere about the same amount of stem mining as the nicotine-oil sprayed plots. In the remainder

of the D.D.T. treatments the amount of such stem infestation was insignificant.

Effect of Treatments on Other Insects.

Contrary to expectation, no noticeable increase in red spider infestation was noted on any of the plots, and this pest, though present in light infestation throughout the bed, at no time assumed important proportions. As this pest is seldom important in autumn bean crops, it appears likely that no trouble need be anticipated where D.D.T. sprays are applied for bean fly control in late crops, though it may be in December-sown crops in bean fly areas. Whilst no advantage was demonstrated from the addition of lime-sulphur to D.D.T. sprays, owing to lack of red spider development, it is interesting to note that these materials can be safely combined for application to bean crops.

Some slight infestation of leaf-hoppers (jassids) occurred on all the nicotine-sprayed plots, but this pest appeared to be well controlled in all the D.D.T. sprayed sections.

Discussion

From the harvest yields of beans from the different replicate plots, it is apparent that the most satisfactory results were obtained where mayonnaise type emulsions containing D.D.T. at a concentration of 0.05 per cent. to 0.1 per cent. were used. This spray at the lower concentration was significantly superior to the straight nicotine and nicotine-sugar sprays, the D.D.T. dust and also to the 10 per cent. emulsion diluted to contain the same amount of D.D.T.—and throughout the experiment appeared at all times to be the best treatment.

The standard nicotine-oil treatment also gave very satisfactory results and a good crop of high quality beans; but statistically showed superiority over only the straight nicotine and the dust treatments.

A locally manufactured material stated to contain 10 per cent. D.D.T. in solvent naphtha with a cresylic acid type emulsifier and diluted to contain 0.05 per cent. D.D.T., gave quite good results, but was not shown to be statistically better than any of the other treatments with the exception of the D.D.T. dust. It is now understood that the crude D.D.T. material used in the manufacture of this emulsion contained only 65 per cent. of the para para isomer of D.D.T. and consequently contained less than 10 per cent. in the emulsion. This may account for the less satisfactory results.

The straight nicotine and nicotine-sugar sprays were significantly superior only to the D.D.T. dust, and the results from these materials were only fair. Any advantage which may have been obtained from the bait spray would probably not be reflected in replicate plots of this nature, but it was evident that the addition of sugar did not depreciate the efficiency of the nicotine sulphate.

The 1 per cent. D.D.T. dust treatment was quite unsatisfactory, giving easily the lowest yield of any of the treatments and many of the beans were of poor quality. Unfortunately no check plots were included in the experiment so it cannot be said if the dust was of any value at all. It is thought that the dusted plants were as grossly infested as if they had received no treatment at all, but the excellent cultural treatment of the bed stimulated these plants to throw out new roots above the injured areas, and thus to persist and produce a fair crop whilst untreated plants outside the cultivated area collapsed when about a month old. The possibility of higher strength concentration dusts being of value still requires to be tested.

Conclusion

Sprays containing 0.05 per cent. D.D.T. or thereabouts offer a very promising method of control of French bean fly when applied at the standard intervals as at present recommended with nicotine-white oil. The advantages of these sprays over the nicotine-oil treatment appear to lie in the lower cost of the diluted spray, smaller quantity required per acre, ease of mixing, control of associated pests, such as bean leaf-hoppers (jassids), and apparent safety of application.

A possible disadvantage may be in the tendency, strongly shown in spring bean crops, to increase red spider infestation. As has been shown in these experiments, however, lime-sulphur at the concentration required for red spider control can be included in D.D.T. sprays with no ill effects on the plants or on the efficiency of the D.D.T. spray, and this combination offers a probable practical solution to this problem.

Some preliminary experiments on wider spacing of spray applications gave strong indications that spraying with D.D.T. sprays at weekly intervals may be quite practicable. Unfortunately this particular set of experiments was wiped out by the torrential rains in April before finality was reached, but the observations made confirmed the opinion that had already been formed, that wider intervals between applications are permissible with D.D.T. sprays than with nicotine-oil.

Dusts containing D.D.T. do not appear promising, but further trials with dusts at concentrations above 1 per cent. are probably worth while.

Acknowledgements

Thanks are extended to Mr. W. Rogers, "Mona Vale," East Gosford, for his co-operation in the conduct of the experiment and to Mr. F. C. McCleery, Biometrician of the Department for the statistical analysis of the results.

References.

[1] MORGAN, W. L.—1938: Agr. Gaz. N.S.W. XLIX, 22-24.

[2] MORGAN, W. L.—1938: Agr. Gaz. N.S.W. XLIX, 501-503.

[3] HELY, P. C.—1945: Agr. Gaz. N.S.W. LVI, 398-399.

For Clean Milk Prevent Contamination from the Cow's Body.

THE cow's body is a serious source of bacterial contamination of milk, as well as the greatest source of visible dirt found in it. The trouble is caused by particles of manure, hairs, dandruff or other dirt dropping directly into the milk pail during milking, and the extent to which this can be prevented will be directly dependent upon the care taken to ensure that the animals are clean at milking time.

Particles of manure adhering to the coat of the animal which become detached during the process of milking are the chief source of infection. Even a small speck of dried manure contains millions of bacteria, and these of the most undesirable types with a capacity for causing spoilage of a most objectionable kind. Consequently the efforts of the clean-milk producer should be largely directed to reducing this infection to a minimum by keeping the body of the cow clean.

The cows can be kept clean more readily if the hair on the udder, flanks and tail is kept short by clipping; much less dirt will then cling to the coat of the animal.

Protection of Seed Wheat from Insect Infestation.

SEED wheat may be protected from insect attack by treating with either magnesite or copper carbonate powder before bagging or storing. The dusts must be mixed with the grain in such a manner as to ensure that every grain is covered with a fine coating of the chemical.

Magnesité is mixed with the grain at the rate of 1 per cent. (approximately 10 oz. per bushel).

Where seed wheat has to be treated for "bunt," copper carbonate is used at the rate of 2 oz. per bushel, and this also controls grain insects.

Mercury dusts and copper oxychloride are also used to control fungous diseases of seed wheat, and it is possible that these dusts may also prevent insect attack.

Animal Manure as a Pasture Improver.

THE benefit to be derived from systematic utilisation of animal manure on the pasture is still to be appreciated by the Australian farmer, and a means of soil improvement which, even only on a plant food basis, is of enormous value is allowed largely to go to waste. Not only has the dung a beneficial effect from the manurial ingredients it supplies, but it also helps to conserve soil moisture and stimulates the action of soil bacteria.

Droppings are always heaviest in night paddocks, and one of the surest means of building up the fertility of a poor area is to use it as a night paddock for an extended period and to harrow in the droppings regularly. In a departmental experiment in renovation of a paspalum paddock it was estimated that in three years by regular grass harrowing a 2-inch mulch of animal manure had been worked into the surface soil.

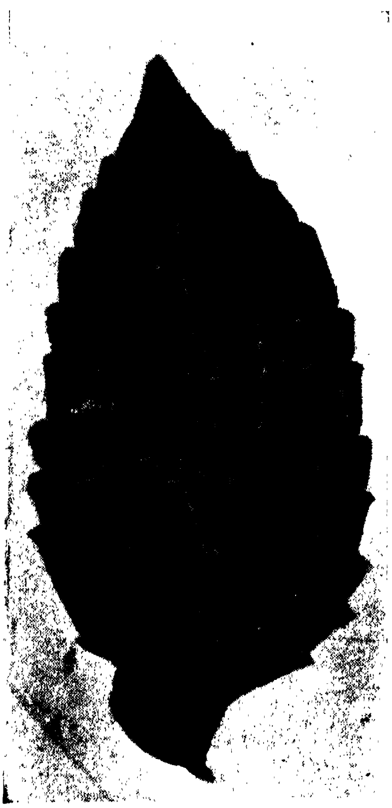
Where harrowing is not carried out regularly, much grass is spoilt and unpalatable tussocks develop around the droppings.

DISEASES OF DAHLIAS.

DAHLIAS are subject to infection by a number of virus diseases, of which two are important in New South Wales; these are "spotted wilt" and "stunt". The fungous diseases powdery mildew and leaf spot also cause damage in some seasons.

Spotted Wilt.

This virus disease is best known for its effects on the tomato, but many other vegetable and flower crops and weeds can also be attacked.



Wavy and Concentric Markings Caused by the Spotted Wilt Virus on Dahlia.

Its effects on the dahlia vary with weather conditions and time of year, and with the variety. Symptoms of infection are shown by the leaves, which develop yellowish spots or rings, and often a pattern of concentric rings or wavy lines of yellow or dead brown tissue. These patterns are most marked on the first-formed leaves, especially in the case of early-planted dahlias. As the plant grows, the new leaves formed during the warmer weather may show no symptoms at all, or only a slight mottling.

The effect of the disease on the growth of the plant varies. Many varieties grow and flower very satisfactorily in spite of the presence of the virus. In others, the growth and flower production and quality are impaired.

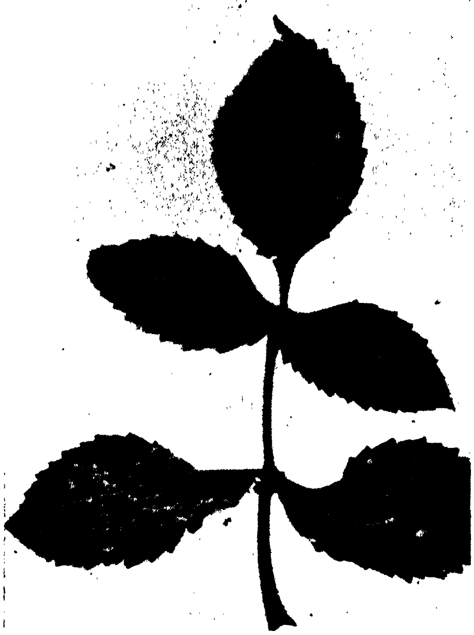
Spots, Rings and Wavy Markings caused by Spotted Wilt, May Develop Conspicuously on Some Leaflets, and Not At All on Others.

Tubers produced by infected plants carry the infection, and plants produced by them in the following year will be diseased. The virus is spread from infected to healthy plants by the feeding of thrips.

Control.

As the virus is almost universally present in named varieties of dahlia it is not practicable to attempt to eliminate it, but varieties in which flower production and quality are affected should be removed and burned.

The virus is not transmitted through the seed, and seedlings, even from infected plants, will at first be healthy. However, by the end of the second season's growth most seedling varieties will have contracted the disease.



Dahlia Leaf affected with Powdery Mildew.

Stunt.

Dahlias affected by this disease are, as the name implies, stunted in habit. A prominent feature is the development of excessive numbers of small shoots, giving the plant a bushy appearance. Flower production as well as vegetative growth is much retarded and the flowers are of poor quality and often deformed, though towards the end of the season growth and flower quality often improve somewhat.

Control.

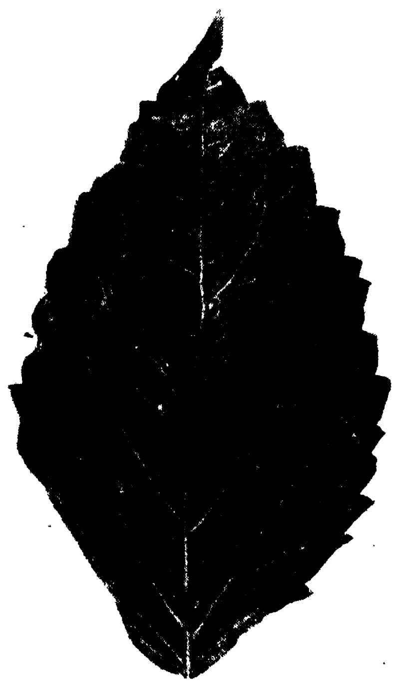
The method of spread of this virus in New South Wales is not known. It is, however, not generally rapid, and by removing and burning affected plants when observed, it can be kept in check to a large extent.

Powdery Mildew.

This disease results from the attack of a parasitic fungus, *Erysiphe cichoracearum*. First symptoms of infection are the appearance of whitish, circular spots on leaves, leaf stalks and stems. These increase in size and coalesce, and finally the whole leaf becomes covered with a powdery white growth.

Control.

In most seasons, the disease does not become of consequence until flowering is almost over and control measures are not required. When it appears at an earlier stage, it may be controlled by dusting the foliage regularly at ten- to fourteen-day intervals with dusting sulphur or a mixture of equal parts hydrated lime and dusting sulphur. Alternately, a spray of lime sulphur (1 in 80) or colloidal sulphur (1 lb. to 50 gallons) may be used.



Entyloma Leaf Spot of Dahlia.

Leaf Spot.

This disease is caused by the attack of a parasitic fungus, *Entyloma dahliae*. Small circular, brownish spots, usually with a narrow, faintly yellow halo, are formed on

the leaves. If these are present in large numbers the leaf may wither and die prematurely.

Control.

The fungus is most active in damp, cool weather. In localities where it occurs, it may be checked by the application of a Bordeaux mixture spray (1-1-20 plus white spraying oil, 1 fluid oz. per gallon). Several applications at intervals of fourteen days may be necessary if the disease shows up early and the weather is humid or wet.

Dahlia "Stunt" (Healthy Plant on Left).
[*After Brierley.*

Trunk and Limb Cankers of Coastal Apple Tree

Caused by Dothiorella.

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

A SERIOUS dieback of apple trees, involving limbs, and sometimes whole trees, has been a source of loss to coastal apple growers for some years. The disease, which is the result of attack by the pathogenic fungus *Dothiorella* sp., may be divided into three distinct forms, namely:—

(A) Bark canker of limbs.

(B) Wood infection following pin-hole borer attack.

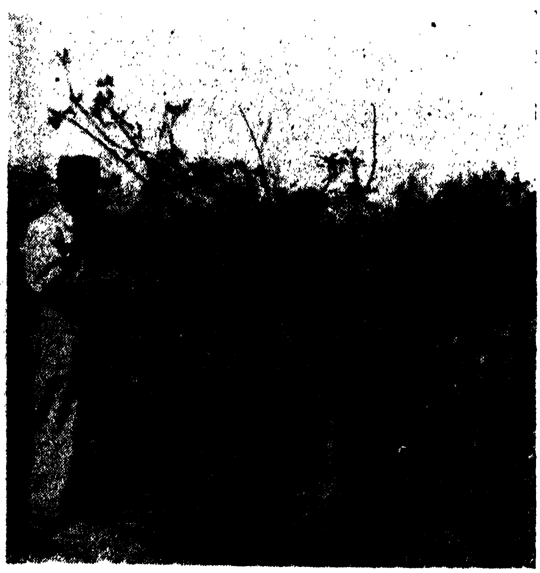
(C) Trunk canker.

Bark Canker of Limbs.

This condition causes a leader and lateral dieback of apples, especially in the Hills District. Infection results in the production in the bark of brown lesions, which extend longitudinally along the limb, or sometimes girdle it, to produce a rapid collapse in spring. The fungus also proceeds in the outer xylem or wood for considerable distances beyond the bark canker, producing black bands of ⅛ inch to ¼ inch in width. The bark canker later becomes depressed, turns from brown to black, and the outer bark layer lifts, giving a ragged, papery appearance. The small, black fruiting bodies of the fungus appear in four to five weeks after infection.

Wood Infection Following Pin Hole Borer Attack.

A brown discolouration of xylem tissue follows attack of apparently healthy apple



Dieback following Pin Hole Borer Attack on Limb.

trees by a pin hole borer. The amount of tunnelling by this borer is but slight in comparison with the damage done to trees.

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C

Trunk Canker of McIntosh Red.
Note that cankers have been excised in an effort to reduce extension.

The bark does not appear to be affected, although it is blackened on the surface by a watery ooze which exudes from the tunnel entrance. However, a scurfy condition of the bark is often found on trees which have been attacked by pin hole borers. This condition would appear to be due to an excessive production of cork in the outer cortex, but the fundamental cause has not been established. The affected area is, at first, moist, but on drying has a papery appearance.

In the wood, brown to black streaks run both upwards and downwards from the tunnels, and from these streaks the pathogenic fungus *Dothiorella* sp. can be isolated.

It is the habit of the pin hole borer to establish, on the walls of the brood chambers, a fungus garden upon which the larvae feed. This fungus is not pathogenic and is distinct from the one which causes the death of limbs and trees.

The theory being investigated at the moment is that the borer acts as a vector or carrier of the fungus *Dothiorella*.

The same association of borer and fungus has been found recently to be responsible for a serious dieback of apricot limbs in the Richmond-Kurrajong area. In this case, the watery ooze mentioned above was absent, but gumming was associated, and bark tissue also appeared to be involved in some cases.

Trunk Canker.

An extensive trunk canker involving the trunk, crotch and lower limbs of the McIntosh Red variety, occurs in the Oakdale district. A pathogenic fungus, also a species of *Dothiorella,* and apparently the same species as mentioned above, has been found to be responsible for the disease. The pin hole borer is also associated with affected areas on these trees.

Infection, which becomes apparent mainly about mid-January, shows as a small, watersoaked, dark coloured area around the pin hole borer tunnel entrance. Cankers extend in the bark, and dark streaks, from which the fungus can be isolated, extend in the wood beyond the extremities of the bark cankers.

Dothiorella Bark Canker on Branch.

Control.

No control measure can be recommended until further information is obtained regarding the role of the borer as a possible carrier of wood infection and trunk canker diseases (B and C). Neither can any control measure yet be recommended for the *Dothiorella* bark canker (A), except that any diseased wood should be cut off to a distance of 18 inches to 2 feet, where possible, below any obvious discolouration in the wood.

Acknowledgment.

The author is indebted to Messrs. H. Parry Brown and F. L. Milthorpe for much of the information contained in this article.

NOTE.—Further work on the above complex of diseases is in progress, the work being carried out by a team consisting of Mr. J. V. McGrath, Fruit Instructor, Mr. E. C. Levitt, Fruit Instructor, Mr. H. Friend, Assistant Entomologist, and the author.

New Plant Diseases.

DURING the year ended 31st December, 1946, the following diseases were recorded for the first time in New South Wales:—

Anemone japonica (Japanese Anemone) —*Sclerotium rolfsii* Sacc. (Crown rot); Metropolitan Area.

Apium graveolens (Celery)—*Rhizoctonia solani Kuehn.* (Crown rot); Metropolitan Area.

Callistephus chinensis (Aster)—*Sclerotinia sclerotiorum* (Lib.) Mass. (Stem rot); Blacktown.

Cineraria hybrida (Cineraria)—*Rhizoctonia solani* Kuehn. (Root rot); Metropolitan Area.

Coronopus didymus (Swine's Cress)—*Peronospora* sp. (Downy mildew); Wyong.

Cosmos sp. (Cosmos)—*Erisyphe cichoracearum* D.C. (Powdery mildew); Metropolitan Area.

Cytisus proliferus (Tree lucerne)—*Armillaria mellea* (Vahl) Quel. (Armillaria root rot); Tocumwal.

Daphne sp. (Daphne)—*Phytophthora* sp. (Root rot); Metropolitan Area.

Euonymus ovatus aureus (Euonymus)—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Gladiolus sp. (Gladiolus) — *Rhizoctonia solani* Kuehn. (Neck rot); Wilde's Meadow.

Hoya carnosa (Hoya) — Spotted Wilt virus); Metropolitan Area.

Hyacinthus orientalis (Hyacinth) — *Sclerotium rolfsii* Sacc. (Bulb rot); Metropolitan Area.

Lathyrus adoratus (Sweet pea)—*Sclerotinia sclerotiorum* (Lib.) Mass. (Sclerotinia stem rot); Blacktown.

Oxalis purpurata (Oxalis) — *Hetorodera marioni* (Cornu) Goodey (Root knot); Metropolitan Area.

Phaseolus vulgaris (French bean) — *Xanthomonas phaseoli* var. *fuscans* (American Common Blight); Yanco.

Phlox divaricata (Perennial phlox) — *Phytophthora parasitica* Dast. (Crown rot); *Verticillium dahliae* (Wilt); Metropolitan Area.

Physalis peruviana (Cape gooseberry)—*Entyloma physalidis* (Kalchbr. et Cke.) Wint.; Metropolitan Area.

Poa annua (Winter Grass)—*Claviceps* sp. (Ergot); Metropolitan Area.

Populus deltoides (Carolina Poplar) — *Cytospora* (*Valsa*) *chrysosperma* (Pers.) Fr. (Die-back and Canker); Leeton.

Portulaca oleracea (Pigweed)—*Rhizoctonia solani* Kuehn (Root rot); Kenthurst.

Primula malacoides (Primula)—*Rhizoctonia solani* Kuehn (Root rot); Metropolitan Area.

Pyrus malus floribunda (Flowering Crab Apple)—*Podosphaeria lencotricha* (Ell. & Ev.) Salm. (Powdery mildew); Orange.

Sapium sebiferum (Chinese Tallow) — *Oidium* sp. (Powdery mildew); Metropolitan Area.

Solanum opacum (Nightshade)—*Heterodera marioni* (Cornu) Goodey (Rootknot); Metropolitan Area.

Tulipa sp. (Tulip) — *Botrytis tulipae* (Lib.) E. F. Hopkins (Fire); Wilde's Meadow.

Viola adorata (Violet)—*Rhizoctonia solani* Kuehn (Crown rot); Canley Vale.

JETTING SHEEP TO CONTROL BLOWFLY INFESTATION.

The Advantages of a Systematic Programme.

DETAILS OF EQUIPMENT AND OPERATION.

(*Concluded from page 44.*)

R. N. McCULLOCH, B.Sc., B.Sc.Agr., Entomologist.

TRIALS by the Department have proved beyond doubt the superiority of a systematic jetting programme over the dressing of sheep struck by blowfly.

This is the third and concluding portion of an article in which the author has discussed the value of jetting and described the equipment required. In this section he deals with jetting mixtures and their use.

Jetting Mixtures.

Jetting mixtures may be considered as calcium arsenite suspension and arsenite of soda solution, the concentrated mixtures of both being either home-made or factory-made. All types, as applied to the sheep, contain the equivalent of 7 to 10 lb. of arsenic (white arsenic) per 100 gallons.

Home-made calcium arsenite is recommended on the grounds of economy (it costs for ingredients about 8s. per 100 gallons of the mixture actually applied to the sheep) and length of time of protection. It gives such practical protection as to necessitate the rejetting of the flock at intervals of four or five weeks, whereas with arsenite of soda the rejetting usually has to be done at intervals of about three weeks when flies are active. Disadvantages of calcium arsenite are the organisation and labour associated with making it, and the fact that, being a suspension of solid particles in water, it needs a good agitator in the jetter tank and certain precautions in the process of re-using run-off. Nevertheless, if the organisation is adequate it can be used without loss of time in jetting. The preparing of the concentrate can usually be arranged to fit in with other work; details of the method are set out below.

Factory-made calcium arsenite costs about 15s. per 100 gallons, and saves a good deal of the time spent in preparing the home-made concentrate.

Arsenite of soda may be prepared as a concentrated solution by boiling on the property as described below. The cost for ingredients is about 6s. per 100 gallons. It may be bought as a cold-water-soluble powder costing about 11s. per 100 gallons of spray mixture. The powder is weighed (in quantities recommended by the maker since the arsenical content of different brands varies) direct to the jetter tank. It is thus the most convenient mixture to use.

Arsenical dips are sometimes used for jetting sheep but are not recommended because of cost—30s. to 40s. per 100 gallons.

New insecticides, such as D.D.T., seem to date (1946) unlikely to replace arsenic for jetting sheep. D.D.T., remarkably poisonous to flies, is not poisonous to maggots.

Experiments with benzene hexachloride, recently carried out by the Department have shown that this substance has considerable promise as a larvacide, and it may be that it will prove even more effective as a jetting mixture than the arsenicals.

Preparation of Jetting Mixtures on the Station.

Calcium arsenite mixture is made by boiling together arsenic, caustic soda and lime as follows:—

Place four 4-gallon buckets of water on a fire. Take four similar but empty buckets and into each weigh first ½ lb. of caustic soda and secondly, 4 lb. of white arsenic (arsenious oxide). Weigh out on to clean paper or bags or into clean buckets four 4-lb. lots of stone lime. A kitchen scale with weights and pan or a clock-faced spring balance will make for speed.

Take the first full bucket of water which comes to the boil. Pour half of its contents into a bucket of soda and arsenic, and

place on the fire to continue the boiling and dissolving of the arsenic. Use the other half to slake 4 lb. of lime, putting in the lumps, 1 lb. or so at a time, and stirring as slaking takes place. Stand the slaked lime beside the fire. When the liquid in the arsenic-soda bucket is clear, though still boiling vigorously, lift it away from the heat of the fire and pour into it a half bucket of boiling milk-of-lime. The arsenic solution will react violently with the lime added to it, and if the lime is poured in too rapidly the mixture will boil over. Place the full bucket of white concentrate beside the fire to simmer for 15 minutes.

When the four buckets of water have been used in this way there will be four buckets full of calcium arsenite mixture, each enough to make 40 gallons of jetting fluid containing 1 per cent. arsenic.

Arsenic and caustic soda are readily obtained at country stores, the latter being sold in press-top tins. Stone lime in bags deteriorates (air slakes) fairly rapidly, but at least one firm in Sydney sells fresh stone lime in drums with press-in lids at a price which keeps the cost of lime in the mixture to about 1s. 6d. per 100 gallons. The ingredients therefore of calcium arsenite present no great difficulties. They cost about 7s. per 100 gallons at country towns. One man can make four buckets of concentrate in an hour. Plenty of buckets should be on hand—for instance, if 2,000 sheep are to be done in a batch, it is best to have two dozen buckets.

The concentrates can be stored for months if in air-tight containers. For this purpose 5-gallon screw-top drums are excellent. Larger bodies of concentrate are too awkward to handle and break down again. For calcium arsenite thorough agitation is needed in the jetter, and any quantity of mixture must be stirred before part of it is taken for use.

Sodium arsenite solution for jetting as originally officially recommended in Queensland contained 0.7 per cent. of arsenious oxide. It continues to be fairly generally used at approximately that concentration. It may be made by boiling in 2 or 3 gallons of water, 3 lb. of white arsenic with washing soda (3 or 4 lb.) or soda ash (about 1 1/3 lb.) or caustic soda (about 1 lb.), and adding the concentrated solution formed to 40 gallons of water for jetting.

Re-use of Run-off Fluid.

Jetting fluid should be thrown at the sheep as fast as the plant will permit and the immediate run-off should be caught and returned to the machine. This system makes for fast jetting, it saves concentrate and water (the sheep take out of the race hardly any more fluid than is needed to saturate the jetted area), and it removes the problem of how to dispose of the waste arsenic which constitutes a danger about some old jetting yards.

The Tononga type race catches the fluid under the sheep being jetted, and delivers it through a spout at the front end of the race.

The best way of returning it to the jetter is to set the machine in a hole in the ground. This is a fairly large operation but well worth-while for a permanent yard. For temporary yards the fluid can be run into a half 40-gallon drum and baled by bucket from there to the jetting machine. In this process of re-using the run-off two points must be watched.

Firstly, if calcium arsenite is the mixture used, care must be taken to avoid a progressive lowering of the strength of the fluid because of the deposit left in the wool. This is a simple matter, merely requiring that the level of the liquid in the tank of the machine be kept more or less constant. This is done by adding ready-mixed new mixture periodically. Start with the jetter tank full and one or more conveniently placed 40-gallon drums of ready-mixed new mixture. Add a few buckets of this to the jetter tank from time to time to keep the jetter tank nearly full. If this precaution is neglected and jetting continued till the jetter tank is nearly empty, by that time the strength of the mixture will have dropped from 1 per cent. to something under ½ per cent. arsenic because of the particles strained out by the wool of each sheep.

Secondly, re-use of waste mixture necessitates silting and straining of dirt from the run-off. This is simple enough, requiring only a silt trap and strainer between the race and the machine. The silt trap is to remove fine sand carried into the box by the sheep. If left in the mixture it cuts the valves in the pump. If the fluid drops into, and overflows from, a tall (14-inch) narrow bucket (made from a 1-gallon oil

tin of the tall type) it will deposit silt but carry over calcium arsenite.

Any jetter must have sieves fine enough to protect the nozzle. The all-important suction outlet sieve in the jetter tank should be of 24-mesh gauze, and to protect this sieve from overloading and choking, run-off fluid should pass through a similar sieve before going into the tank. This is usually built in, in the lid. If re-using run-off with a big machine it is worth taking out the coarser particles, wool, burr, etc., by 10-mesh gauze before the fluid gets to the jetter.

Notes on Personal Protection.

All jetting fluids are injurious to the operator if he cannot avoid constant wetting. On the face, wetting alone causes distressing soreness. For the hands and arms, wetting alone seems more or less harmless—the more important requirement appears to be the avoidance of scratches of the wet skin or of application of pressure to wet finger nails. Gloves, even though full of sweat plus some jetting mixture, seem to protect effectively against general jetting soreness. The type recommended are rubber electricians' (250v.) or canning gloves. If dried and powdered after use they last for many months. They should be supplemented by the wearing of home-made sleeves of light canvas.

For raised races an excellent face screen is that illustrated. It is made by attaching to the brim of a hat a 13-inch x 8-inch sheet of petrol tin or 24-gauge aluminium which has an 8-inch x 2-inch opening opposite the eyes. This opening is covered on the inside of the curve of the shield by a 9-inch x 3-inch strip of celluloid held in place by a slide-on paper clip. When the celluloid becomes dirty it is replaced by a clean strip. For uninterrupted work two of these screens and some two dozen spare celluloid strips are required. When the one in use is dirty the operator changes. The member of the team in charge of mixtures then fits a clean celluloid strip and leaves the screen ready for use. Clear celluloid ($\frac{10}{1000}$ inch gauge) can be bought in Sydney for about 5s. per square yard.

Sunlight on spray-spotted celluloid dazzles the operator. This is prevented by a shelter over the jetting box either permanent or temporarily rigged from hessian or tarpaulin, e.g., the cover of the jetting machine.

Jetting Injury.

Jetting injury of healthy, unstruck sheep can be important. It consists of a deep slow-healing sore somewhere on the jetted area, and sometimes crippling or killing numbers of sheep. It is caused by excessive pressure which forces some of the arsenical fluid through the skin. It can be avoided completely by never using a higher pressure than is required to wet the fleece to the skin and give saturation quickly. With a 5-jet nozzle a pressure of 40-90 lb. for 4-20 weeks' growth of wool has proved efficient and safe for many thousands of sheep. For a man beginning to jet, an excellent precau-

Operator wearing Face Screen, Canvas Sleeves, Rubber "Utility" or "Canning" Gloves and holding a Five-jet Nozzle.

tion consists of colouring the mixture with red oxide of iron (½ lb. per 100 gallons), examining a few sheep as they are done, and gradually raising the pressure from something very low till satisfactory saturation and speed are reached.

Jetting at any pressure can be injurious or fatal to badly-struck sheep, but is apparently harmless to small strikes. Regular jetting to control strike involves the jetting of small strike patches on sometimes a large proportion of the flock. If jetting and re-jetting are done at the right time the operation is harmless, and all small strikes go through the race without delay to the job or ill-effect to the sheep. When jetting has

been neglected until bad strikes exist in the flock, the sheep concerned have to be taken out and dressed.

Practical Points about Jetting.

1.—Fill the wool with fluid in the crutch, well down, and nearly as wide as a wide crutching at the sides and over the tail.

2.—The wool tip is easy to wet—the clean wool underneath more difficult.

3.—The greasy wool right in the crutch is particularly resistant to wetting and hangs vertically as the sheep crouches.

4.—Therefore, jet upwards in the crutch and downwards over the tail, so that the stream of fluid reaches the skin and floods back through the fleece. Begin and finish in the crutch, the most important part.

5.—Open wrinkles as the jet is applied by lifting the wool with the left hand ahead of the jet.

6.—If in doubt use a colour. It is impossible to tell with a colourless mixture whether saturation of the wool is complete. Red oxide, ½ lb. per 100 gallons of jetting mixture, gives a colour which shows up in the wool and, since it will scour out in the normal process, is harmless. Since there may be a prejudice by wool buyers against colour, and since shearers may fear a colour and attribute objectionable features to coloured wool, it is probably sound practice to use colouring only at the beginning of the season or for a new operator.

7.—A convenient team with single sheep races consists of operator, penner-up and man in charge of mixtures—who will have some spare time for penning up. If the machine is set in the ground to receive run-off direct, mixture management is reduced to the job of putting two or three buckets of ready mixed new mixture into the jetter tank every 10 minutes. With whatever mixture is being used, but especially for calcium arsenite, it is convenient to start jetting with two or three 40-gallon drums of ready mixed fluid beside the machine. For calcium arsenite a drum has to be stirred up before the fluid is run or bucketed out to the jetter.

A Home Made Concrete Mixer.

A HOME-MADE concrete mixer that enables the work to be done well and cheaply—and with much less effort than with a shovel—came under notice during a visit to South Australia a few months ago when I had the opportunity of visiting a number of piggeries in connection with the Baconer Carcase Competition.

As the illustrations show, the mixer is made from the rear axle assembly of an old motor car, mounted on a heavy wooden framework, with a drum attached to the main shaft. The power is supplied by a tractor and a belt to a tyre rim on one wheel. Two lengths of iron pipe—one to the front and one to the rear—are secured to the axle housing by the spring U-bolts.

The drum is held in an elevated position while the materials are being mixed, by suspending a bucket of concrete on the end of the pipe to the rear, and the concrete is tipped into a barrow—or perhaps on to the job—by the removal of this bucket.

The Home-made Concrete Mixer.
Left.—Rear view. *Right.*—Front view.

This mixer is surely "home-made," but it could contribute to making farm work easier and be very useful in a small community.—A. F. GRAY, Chief Piggery Instructor.

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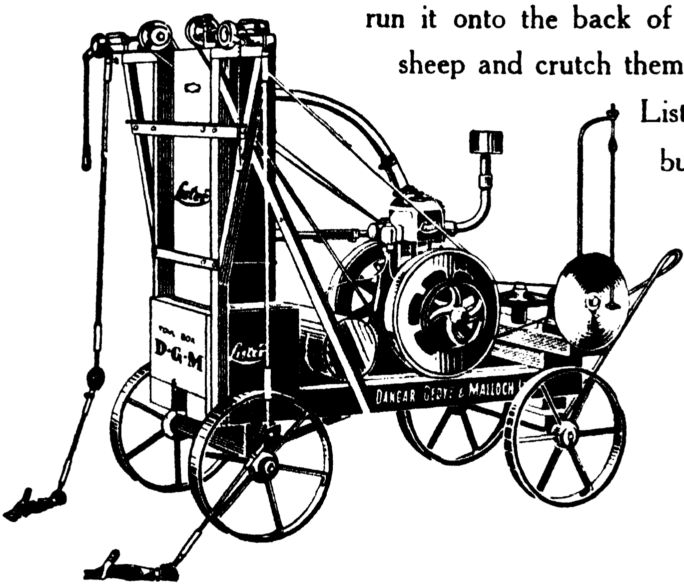

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FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

"STEELY" WOOL

Caused By Copper Deficiency.

A SURVEY TO DETERMINE ITS INCIDENCE IN THIS STATE.

DURING recent years it has been found that small amounts of copper are essential to animal life. Although requirements are small, the soils of certain areas in South Australia, Western Australia, Tasmania, Queensland and Victoria contain so little copper that stock, particularly sheep pastured on these areas, fail to thrive and develop diseases due to copper deficiency. The administration of small quantities of copper is sufficient to restore such animals to health.

Where the amount of soil copper is low, but not so low as to cause actual death, the first evidence of deficiency in sheep is found in the wool, which shows lack of crimp and character, a peculiar silky lustre and often a secondary wave or crimp two to six times as great as the normal crimp. Such wool has been referred to as "stringy" wool, "steely" wool, "straight steely" wool and "silky" wool.

There is reason to believe that some parts of New South Wales may be deficient in copper* and that, as a result, steely wool is produced in some seasons. Wool showing changes similar to those seen in steely wool have been noted from Grenfell, Scone and New England. Steely wool has been identified in all other States, so that it would be surprising if New South Wales were entirely free of the condition.

Yield and Value are Depreciated.

"Steely" wool is not only inferior in appearance, but the yield of wool per sheep is less, and the physical and chemical characteristics—such as reactions to dyes and manufacturing quality—are different to those of normal wool. Steely wool commands a lower price than normal wool, being depreciated as much as 5d. per lb. In South Australian experiments carried out by the Council for Scientific and Industrial Research, the value of wool from sheep running on copper-deficient country was increased by 6s. 4½d. per sheep by supplementing with copper.

The condition may occur only intermittently on any one property. Wool may be nearly normal in some seasons, and show marked "steeliness" in a high proportion of fleeces in the next. All clips usually show a few "doggy" fleeces. These may, in some cases, be due to copper deficiency, but in many are probably due to poor breeding or ill-health of the individual sheep. Such wool is often unsound. Steely wool is, all other things being equal, usually sound, but the fleece does not show the compactness of normal wool.

(Continued on page 106.)

*WARNING.—*Feeding of copper-containing licks or topdressing with copper should, under no circumstances, be carried out until proper investigation has indicated the necessity for such action. In many parts of New South Wales sheep suffer from an excess of copper, which produces the disease toxaemic jaundice. Adding extra copper to the diet through licks or by topdressing may quite likely precipitate outbreaks of this disease in areas which would otherwise remain free.*

Apiary Notes

THE PRESERVATION OF NATIVE EUCALYPTS

IS ESSENTIAL TO AUSTRALIAN BEEKEEPING.

D. L. MORISON, B.V.Sc., Apiary Branch.

BEE-FARMERS in New South Wales, and, in fact, throughout Australia, mainly depend on native Eucalypts as the source of payable crops of honey, and it is evident that the amount of Eucalypt flora available will ultimately prove the limiting factor in honey production in Australia. Apiarists are, therefore, keenly interested in methods of land utilization that affect the preservation or destruction of the various species of trees. In this dependence on trees Australia differs from most other heavy honey-producing countries.

Indiscriminate Destruction in Days Gone By.

In order that the position may be considered in its true perspective, it is necessary to realise that in the early days of settlement vast areas of this continent were covered by unbroken belts of the various species of Eucalypts. However, in the "development" of the country by those engaged in the main primary industries, much of this timber has been either utilised or merely destroyed in the process of clearing the land for crop and pastures.

While it is admitted that a certain amount of clearing of timber has been necessary, it is obvious that, in many instances, it has been carried out to excess, and without any useful planning for the future. During this indiscriminate destruction, a large number of excellent honey producing trees, including those of the famous Yellow Box species and ironbarks, were needlessly sacrificed.

The Position is Different in Other Lands.

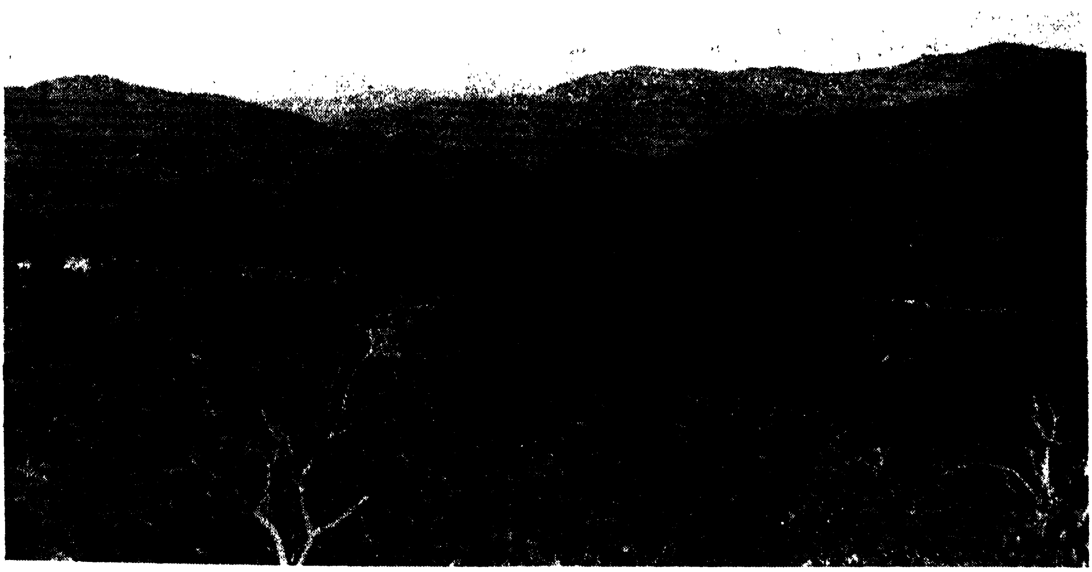
In the United States of America, the destruction or utilisation of trees for timber purposes, particularly the conifer species, did not interfere so much with honey production. This type of flora, not important, for extension of bee-farming, was replaced with the expansion of farming and grazing, by clovers, buckwheat, lucerne, etc.—all excellent honey plants. In New Zealand, too, the advance of the agricultural and pastoral industries has been followed by great development of the growth of clover and

Mr. E. E. Abrams' Apiary, Established on the Fringe of the Snowy River Valley.

other useful crop plants which produce better crops of quality honey than would have been secured from the natural tree flora.

However, conditions are quite different in Australia. As already indicated, our native Eucalypts are the main source of honey production, and following their destruction, we can only anticipate, owing to the poor soil type, a low percentage of replacement from such honey sources as lucerne, clovers and weeds such as thistle, Paterson's Curse and Cape Weed, etc.—although it must be admitted that these sources are helpful at times.

Some rather extensive reserves of timbered country still exist in New South Wales, and with development of suitable roads these reserves may gradually become available to bee-keepers. There is a good deal of this country about the Dividing Range and between the coastal rivers, and it includes forests under control of the Forestry Commission and safeguarded to a large extent for the future. There are also considerable timber reserves not yet exploited in the inland divisions, *e.g.*, the hilly country in the Bathurst district, embracing an area from Rockley, Burraga, Abercrombie River and across to Trunkey Creek.



A General View of the Snowy River Valley

Timber Reserves in New South Wales.

For the future extension of bee-farming in this country we look forward to activities in connection with tree planting for the prevention of soil erosion and to replace hardwoods, together with proper control of the reserves of timbered country and the growing of crop plants useful for honey production which has done so much for bee-farming in other countries.

The Snowy River Valley Country.

Fresh reserves of country also come under notice as migratory bee-keepers search out new areas to be exploited. The latest find of this type is the Snowy River Valley. A recent inspection of this country revealed the existence of a very extensive belt of White Box, together with other species of Eucalypts of value for honey production, including a useful field of Yellow Box.

A number of bee-farmers operating on the fringe of this country—the present accessible portion—during the past couple of years have secured heavy crops of honey from Yellow Box, White Box and other species and this has given proof of its honey producing potentialities. An important aspect of this Snowy River country is that the White Box flowers during the early active working season for bees; in other parts of the State it mainly flowers during winter. The Snowy River Valley cannot be classed as really rugged country, and if useful by-roads can be extended in future years, the present untapped avenues for honey production will prove a valuable asset.

Bee-keepers' associations are advocating that the more important reserves of timbered country, including the Snowy River Valley, be placed under control of responsible authorities. If these areas are taken up by private persons, it may be readily assumed that much of the timber will be destroyed. As practically all these areas are on poor class pastoral country, and in many instances are within the watershed of rivers, there are sound reasons, apart from honey production, why they should be properly controlled.

Some useful roads may be extended by the authorities to tap useful timber resources, but it is considered that bee-keepers interested in any particular country should also assist in this direction. The advances made in the technical improvements of modern earth-moving equipment will doubtless facilitate the roading of the areas in due course.

The Future of the Industry Depends on Planning Now.

In this young country the bee-farming industry should continue to make good progress for many years to come. The truth of this statement is illustrated by the progress made in migratory bee-farming. During some seasons, half the hives of bees in this State may now be found on the South Coast Division, and moves are also made to other Divisions when honey flow prospects are promising there.

However, the future of our apiculture and of tree preservation depends on the implementation of a well prepared plan. Now is the time for action; another five or ten years of such depredations as experienced in the past in connection with trees which are useful for honey production and timber supplies may well prove disastrous, not only to the bee-farming industry, but to primary industry in general, as well as some secondary industries which rely for their continued existence on readily available timber supplies.

Minister Impressed by Danish Cattle and Pigs.

PRIOR to leaving England for U.S.A. the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), who is leading the New South Wales Stock Buying Delegation, visited Denmark, accompanied by Mr. G. D. M. Carse (Piggery Instructor).

Mr. Graham was impressed with Denmark's dairy cattle and pigs. About 90 per cent. of that country's dairy cows are of the Danish Red breed, which is all red without a single white spot. Although the cattle protein ration has been cut down because of lack of transport to import oil cake and other essential feedingstuffs, many cows are producing up to 1,000 lb. butter a year.

The Danish Landrace pigs were the closest approach to the ideal baconer type he had ever seen, said Mr. Graham. They were white, with small head, light jowl, shoulders fine and set well into the sides, very long middle piece, even top and bottom lines, and good full hams. It was the only breed allowed to be used for breeding and no importations were permitted. That policy ensured standardisation of type and had been responsible largely for Denmark's successful export trade.

The Poll of Potato-growers.

A POLL of potato producers on the question of the constitution of a Potato Marketing Board for the State of New South Wales was taken on 21st December, 1946.

Dr. H. J. Hynes, Chief of Division of Marketing (Returning Officer for the Poll), has announced that the poll resulted in 1,829 votes being cast in favour of and 209 against the formation of a Board. Four-fifths of the producers entitled to vote duly recorded votes.

Action will proceed shortly for the election of producers' representatives and the constitution of the Board.

THE PASTEURISATION OF SHELL EGGS

To Prevent Storage Rot and Maintain Quality.

A Progress Report of Experimental Work.

T. W. MURPHY, B.Sc., Bacteriologist, and W. S. SUTTON, B.Sc.Agr., Senior Biologist.

IN trials conducted by the Department it has been shown that pasteurisation, in heated water, of eggs infected with rot organisms is an effective method of preventing rotting during subsequent cold storage for six weeks and storage at room temperature for two weeks. The treatment was found to stabilise internal quality and to protect the eggs against deterioration in storage.

Commercial application of this principle is dependent upon the designing of suitable mechanical equipment.

A great deal of attention has been devoted to the preservation of shell eggs—for both the domestic consumer and the commercial operator are constantly seeking improved methods of conserving seasonal surpluses or of exporting to oversea markets.

It is now accepted that washing eggs in order to bring them up to the export standard of cleanliness is a potent source of spoilage; due to the inherently unhygienic manner in which eggs are commonly washed, bacterial invasion is established and a variety of rots follows in a disturbing proportion of instances. The possibility of eliminating the rotting bacteria by the use of chemicals in the washing process was thoroughly explored by numerous investigators both here and abroad, but no satisfactory method was evolved.

Although it is possible that adequate chemical control of egg washing may yet be achieved, it seemed desirable to seek other methods in the meantime. The results of investigations by Funk[1] directed the attention of other workers to the possibility of preservation by pasteurisation; Funk showed that heat treatment of eggs could both destroy invading bacteria and stabilize albumen quality. Some preliminary experiments were carried out by the authors* using Funk's technique wherein eggs were pasteurised in paraffin oil at 140 deg. Fahr. for ten minutes[2], and the quality of eggs so treated compared very favourably with those preserved by a number of coating methods.

Because of numerous objections to the use of oil under commercial conditions, it was decided to use water as the heating medium in this series of trials. A number of trials was, therefore, conducted with the object of ascertaining the most satisfactory time and temperature of treatment that would ensure destruction of both bacteria and enzymes, but which would not cause coagulation or other damage to the albumen or yolk, thus giving an egg in which all of the desirable qualities would be retained without the production of any adverse changes in flavour or appearance.

Experimental.

Fertile unwashed eggs were infected with a strain of *Pseudomonas* selected from a number recovered from rotten eggs and chosen for its potency in reproducing rots. The eggs, warmed to about body temperature, were lightly abraded with emery paper while being washed in a cool aqueous suspension of *Pseudomonas;* they were left in the bacterial suspension for 30 minutes. The initial difference of temperature between eggs and water was 12 Centigrade degrees. This technique was adopted to ensure that the eggs were exposed to conditions no more favourable than those in which uncooled eggs might be washed by those producers who allow the wash water to become increasingly contaminated with faecal matter, dust and grit, etc.

As eggs are commonly collected from the farm twice a week, the infected eggs were kept at room temperature for three days before being pasteurised. After subjection to the selected heat treatment, in which the eggs in wire baskets were immersed in a relatively large volume of water and rotated backwards and forwards, they were stored at 32-33 deg. Fahr. for six weeks, followed by storage at room temperature for two

* Unpublished report, 1945.

weeks. These storage conditions were selected as being similar to those which export eggs would undergo before reaching the consumer.

Many preliminary trials were carried out to determine the range of conditions which, while satisfactory in other respects, would avoid coagulation of the albumen. The appearance of any sign of precipitation in the broken-out white, not necessarily involving adherence to the shell membrane, was interpreted as coagulation.

The results obtained indicated that, for an exposure of five minutes, a temperature of 142 deg. Fahr. caused appreciable coagulation, and a temperature as low as 136 deg. Fahr. caused some coagulation; and that with 10 minutes or more exposure it was not safe to exceed a temperature of 132 deg. Fahr. The treatments which gave eggs without coagulated albumen included temperatures of 130 and 138 deg. Fahr., and ranged in time from five minutes to thirty minutes. This conforms closely with the later findings of Funk as outlined in a personal communication (1946).

In the majority of cases the number of eggs treated in each group was thirty; all were examined by candling before treatment.

When the eggs were inspected at the end of the period of storage all were examined by candling for the presence of rot and gross internal changes; the loss of weight was determined for each group and twenty-five were broken out and examined for coagulated albumen and broken yolk and an estimate was made of the albumen score[4] and yolk index[4]; the flavour of the soft-boiled (3½ minutes) egg was tested in the remaining five eggs. In considering the value of the treatments used it is obvious that some features will justifiably weigh heavier than others. It is suggested that—apart from unsatisfactory bacteriological condition—flavour, albumen score and yolk index will have more influence on most observers, particularly housewives and consumers, than loss of weight. It was decided to evaluate the efficiency of the various treatments by allotting the following points for each criterion:

Flavour .... 40 points.

Full score was awarded when no defects of flavour were apparent; 30 points indicated that the egg was edible although slight defects in flavour were detected; 20 points were given to eggs wherein the off flavour was more noticeable although the egg was still edible; 10 points were awarded to an egg which had become inedible without being objectionable; whilst an offensive egg was given no points.

Albumen Score .... 25 points.

Full score was given to eggs with an albumen score of 2.0 or better; 3 points were deducted for each increase of 0.5 until scores over 5 were recorded; when no thick albumen was present, no points were awarded.

Yolk Index .... 25 points.

Full score was given to eggs with a yolk index of 0.333 or better; 3 points were deducted for each decrease of 0.025; no points were allotted when the index fell below 0.16.

Loss of Weight .... 10 points.

Full score was given when the loss of weight was less than 2 per cent.; 1 point was deducted for each further 2 per cent. of loss. Thus an egg losing 20 per cent. of its weight would fail to gain any points.

Maximum .... 100 points.

Discussion.

The results obtained are shown in Table 1, together with the comparable scores obtained by applying the suggested methods of evaluation. They indicate that the longer treatment periods are more successful in maintaining quality, a score of 83 being obtained after 30 minutes at 130 deg. Fahr. compared with 72 after 5 minutes at 134 deg. Fahr.; the improvement, however, occurred in the yolk index rather than in the flavour. The incidence of broken yolks was also less when the longer time-lower temperature combinations were used.

Good scores were gained by eggs treated at 130 deg. Fahr.; pasteurisation at this temperature would appear to require critical observance of selected conditions, for some rots were obtained after 15 minutes treatment at this temperature but were not found on repeating the experiment.

The figures for loss of weight compare favourably with those shown by untreated eggs kept under cold store conditions; loss incurred by the latter amounted to 2.9 per

cent. in winter and 3.8 per cent. in summer, while the maximum loss in the case of pasteurised eggs was 4.6 per cent. and did not exceed 4 per cent. in the majority of the trials.

The internal quality of the treated eggs, as measured by albumen score and yolk index, is equal and sometimes superior to that of the cold-stored control eggs. It seems clear that pasteurisation will effectively stabilize the internal quality and protect the egg against deterioration in storage.

The flavour was tested by eating after soft boiling. This is a stringent test and the pasteurised eggs scored very well, generally proving as satisfactory as, and in several cases better than ordinary cold stored eggs. Eggs which had been opened for examination of internal quality were frequently scrambled or fried by various persons and were reported as satisfactory in every instance but one; the exception was the group which had been treated at 138 deg. Fahr. for 5 minutes, and in this case the boiled eggs also gave a low score—21—the reason for which was not evident.

It will be noted that the total score of untreated cold store eggs was exceeded by all of those eggs given a long time-low temperature treatment, indicating that this type of pasteurisation may be expected to retard deterioration in eggs so treated. Both types of control eggs, infected and uninfected (the latter not being washed at any time) show lower scores when stored at room temperature than when kept in cold store; this emphasises the necessity of exercising the utmost care in handling and shipping if commercial losses are to be kept to a minimum. It is of interest to note that the occurrence of up to 20 per cent. of rots in the infected control of eggs (cold store) corresponds approximately with what might be expected with washed eggs under severe conditions in commercial practice.

Although it is evident that the introduction of pasteurisation as a means of preventing rots in washed eggs would prove effective, commercial application of the principle would only be possible if suitable mechanical equipment were designed.

TABLE 1.—EFFECT OF STORAGE ON CERTAIN QUALITIES OF PASTEURISED EGGS.

Pasteurisation.		Percentage of Eggs with—			Loss of Weight.		Average Points awarded for —			Total Points Scored.	Time of Experiment.
Time.	Temperature.	Rot.	Coagulated Albumen.	Broken Yolk.	Percentage.	Points awarded. (Max. 10.)	Albumen Score. (Max. 25.)	Yolk Index. (Max. 25.)	Flavour.† (Max. 40.)	(Max. 100.)	
5 minutes ...	134 Deg. Fahr.	0	0	25	3·8	9	20	14	29	72	S.
5 ,, ...	136 ,, ...	0	5	20	3·8	9	20	17	28	74	S.
5 ,, ...	138 ,, ...	0	0	5	3·6	9	23	22	21	75	S.
5 ,, ...	140 ,, ...	0	5	25	3·9	9	17	13	28	67	S.
5 ,, ...	142 ,, ...	0	55	30	4·0	8	18	16	33	75	S.
7½ ,, ...	130 ,, ...	0	0	7	3·2	9	21	22	28	80	W.
10 ,, ...	130 ,, ...	0	0	3	3·0	9	21	23	25	78	W.
12½ ,, ...	130 ,, ...	0	0	3	3·2	9	23	24	25	81	W.
15 ,, ...	130 ,, ...	7	0	0	3·2	9	23*	24*	27	83	W.
15 ,, ...	130 ,, ...	0	0	3	4·6	8	22	22	27	79	S.
22½ ,, ...	130 ,, ...	0	0	3	4·3	8	22	21	32	83	S.
30 ,, ...	130 ,, ...	0	0	0	3·4	9	20	24	30	83	S.
7½ ,, ...	132 ,, ...	3	0	7	3·0	9	24*	22*	27	82	W.
Controls—											
Infected, unpasteurised, stored		90	0	0	8·7	6	23*	23*	...	...	W.
room temperature		90	0	0	11·8	5	11*	9*	...	...	S.
Infected, unpasteurised, stored		20	0	7	2·4	9	23*	22*	21*	75	W.
cold store		13	0	10	4·0	8	14*	16*	27*	65	S.
Uninfected, unpasteurised,		0	0	10	7·8	7	17	20	24	68	W
stored room temperature ...		0	0	40	9·2	6	7	6	14	33	S.
Uninfected, unpasteurised,		7	0	10	2·9	9	21*	21*	26*	77	W.
stored cold store		0	0	17	3·8	9	14	16	27	66	S.
Initial quality		0	0	0	..	10	24	25	40	99	W.
		0	0	0	...	10	23	25	40	98	S.

* Average score of eggs which did not develop rot.

W. Means experiment conducted during winter months. S. Experiment conducted during summer months.

† Scale of Flavour Scores.—normal egg, 40; edible, 30; barely edible, 20; inedible, 10; offensive, nil.

Summary.

1. Infected eggs were pasteurised in water at various temperatures and times, and submitted to quality examination after storage.

2. Best results were obtained by pasteurisation at 130 deg. Fahr. for 30 minutes; 15 and 22½ minute treatments were also satisfactory.

3. Pasteurisation is an effective means of destroying *Pseudomonas* in washed eggs.

Acknowledgments.

The authors wish to acknowledge the co-operation of Mr. E. Hadlington, Poultry Expert, and Mr. D. C. Duncan, Manager of the Seven Hills Poultry Experiment Farm, in making available the eggs used in this work, and of Mr. Driscoll, Manager of the Waterside Cold Stores, Pyrmont, who kindly made cold store facilities available.

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Feeding Notes—*continued from page 99.*

Both Crossbreds and Merinos Affected.

Steely wool can occur both in Merinos and crossbreds. A sample of wool from a crossbred sheep running on copper-deficient country in South Australia, but which was treated with copper half way through the wool-growing year, shows the wool produced during the copper-deficient period to be lacking in crimp, the secondary wave giving an apparent count of about 36's compared to a count of 54's, with great improvement in appearance after copper was added to the diet. Similarly, Merinos may show an apparent count of 54's which changes to 70's when the diet is supplemented with copper. A close examination of the samples referred to below will show other differences between normal and steely wool.

Specimens Available for Inspection.

The New South Wales Department of Agriculture is endeavouring to ascertain whether copper deficiency, causing steely wool, is occurring in this State, and if so what districts are affected.

All Veterinary Officers, Sheep and Wool Instructors and Stock Inspectors of the Department, as well as firms handling large quantities of wool, have been supplied with posters showing samples of steely wool, and these specimens are available for inspection. If after examination of the specimens it is considered that steely wool may be occurring on a property, the owner should discuss the matter with his district officer.

Prevention of Feed Flavours in Milk.

FEED flavours are produced by strong smelling or tasting materials being absorbed from food in the gut and excreted in the milk. As this process will usually only last for a few hours after the food has been eaten, feeding such materials immediately after milking will usually leave no taint at the next milking.

Cabbage, turnips, onions, garlic, rape, kale, lucerne, clover, silage and carrot weed are the commonest materials to be watched in this respect. The absorption of feed odours from the air is very rarely to blame for tainted milk.

POULTRY NOTES

CULL UNPROFITABLE BIRDS

To Reduce Food Consumption.

E. HADLINGTON, Poultry Expert.

IN view of the shortage of poultry foodstuffs, the best course to adopt on all farms is to dispose of any birds which are not of a desirable standard of development.

Farmers who have September and later hatched pullets which have not developed satisfactorily will have scope for culling from now onwards. Birds hatched at the end of September will now be four months old, and should be nearly fully developed in body size. However, where they have had a setback in rearing, there are usually some which are weedy and unthrifty. These birds will not show much further development until the cool weather of the autumn commences—which means that they will be at least seven to eight months old before they are likely to commence production, and they are unlikely to lay consistently through the winter and spring. Thus, under present conditions particularly, these birds should be heavily culled to save food consumption.

Culling Hens.

The culling of the older hens should be carried out at intervals as their production goes below a payable level; only those which do not moult until late autumn will be worth keeping for another laying season. First-year hens which commence to moult before the end of this month will mostly prove unprofitable, as few will come back into production any earlier than the later moulters, and poultry-farmers who are having difficulty in obtaining feed supplies should cull at least the worst specimens of these early moulters. Hens to be culled should be disposed of before they actually commence to lose their feathers, otherwise they will bring low prices on the market.

No difficulty should be experienced in detecting hens which are about to moult, as the comb commences to wither and contracts, the pelvic bones close and the whole abdomen tightens and loses the

characteristic softness of the laying hen. After this stage the feathers will commence to fall out and be replaced by pin feathers. Birds in this condition are not attractive to buyers, hence the necessity to market them before they are advanced in the moult.

Clean up the Chicken Pens.

Although many poultry farmers make a practice of thoroughly cleaning and disinfecting the chicken pens as soon as they are emptied for the season, there are still some who neglect this important work and allow the pens to remain in a dirty condition until they are required for the next season's chickens. Such conditions are not conducive to the satisfactory rearing of chickens and often lead to outbreaks of disease.

Those who have not already sterilised the chicken pens and equipment should do so without delay and before the runs become overgrown with grass or weeds. If they are already covered, the best course is to chip the outside runs and give them a thorough cleaning before allowing the grass to grow again. Where small runs have been in use for a number of years, it is advisable to remove 3 or 4 inches of the surface soil and fill up again with good, clean soil, which should be allowed to settle down thoroughly before the pens are required for the new chickens.

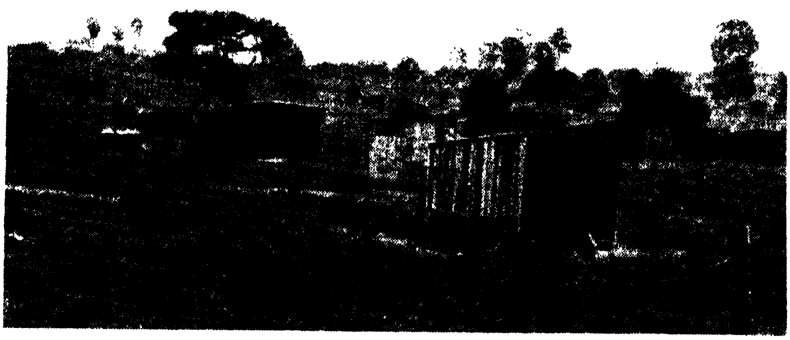
To clean the interior of the pens, thoroughly scrub all the floor and woodwork which has become fouled with droppings, and then disinfect with a strong disinfectant solution. It should be realised that disinfectants are more effective when applied to clean surfaces, than when used on dirty floors or woodwork.

Avoid Overcrowding.

The hot and humid weather usually experienced during February necessitates particular attention being given to the management of young stock to avoid moulting and respiratory diseases. Overcrowding (either as the result of having too many birds in one house or the perches being too close together) and lack of ventilation are likely to lower the resistance of the birds to roup diseases or cause an early moult.

One of the first indications of approaching trouble is a paleness of the faces and a general dull appearance of the head. These signs indicate that the birds are suffering through being overheated at night; in many cases the next stage is a discharge from the nostrils and if conditions are not improved, the birds will often become emaciated and mortality can be expected.

Every effort should be made to avoid transferring young stock to adult houses, and filling the house to full capacity before the end of the summer. It will be found that even though a large house may not appear to be overcrowded, young stock will mostly keep to one end of the house, and during humid weather this may cause as much trouble as overcrowding in a smaller house. The safest course, therefore, is not to place more than about 100 pullets in the adult houses, and then fill them to capacity after the cool weather in the autumn commences.



Good Conditions for Raising Stock in the Summer.

Provide for Winter Green Feed Crops.

Between now and April is the best time to sow green feed crops to provide green feed through the winter and later in the year. The two most suitable crops for providing a continuous supply of green feed

throughout the year are lucerne and Berseem clover.

The best time to sow the seed of Berseem clover is during February or early March, while lucerne should be sown in March and April. The main consideration in the preparation of the land for these crops is that it should be free from grass and weeds and cultivated to a fine tilth before sowing the seed. Both these crops can be sown in drills, but this is more important in the case of lucerne than Berseem clover, which being an annual could be sown broadcast if desired. However, when grown in drills both crops can be more easily cultivated and manured if the rows are about 18 inches to 2 feet apart.

Where a watering system is installed and manure is applied at intervals between the rows, Berseem clover will grow profusely during the winter months, thus providing a supply when lucerne is more or less dormant, and can be cut up to October or November.

If Berseem clover seed cannot be obtained it will be found that Red clover is also a suitable crop, but does not grow quite as profusely during the winter months, although, on the other hand, it will last for two or three years compared with one season for the Berseem clover. Other crops which will provide a supply of green feed from May to July are barley and rape, and these crops can be sown broadcast between February and May.

Watering the Crops.

To ensure a regular growth of green feed during the hot weather, it is essential to irrigate the crops, and for this purpose an overhead spray system is the most suitable. During dry spells it is advisable to give the crops a good soaking as frequently as is necessary to keep the ground moist. If the crops are allowed to become wilted they lose much of their food value and do not grow as well as when an abundance of water is provided; thus it is false economy to reduce the water to save a little cost.

Watch for Red Mites.

During the summer months poultry houses may become heavily infested with red mite if a close watch is not kept on this parasite. Usually the painting of the perches with creosote or other heavy oil at intervals of about three months will prevent the mites from gaining a hold in the house, but if this pest is neglected and allowed to spread to the walls of the house and the nests, it becomes necessary to spray the house thoroughly to control the parasite.

One of the cheapest and most effective sprays for red mites is kerosene emulsion.

(Continued on page 111)

Lucerne Growing in Rows and Irrigated by Overhead Spray.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. A., "Heathfield," Boorowa ...	23	18/12/46
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys)	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	29	5/3/47
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	49	15/1/47
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46
Knight, G., Tannabah, Coonabarabran ...	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47
Wagga Experiment Farm (Jerseys)	15	1/2/47
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns)	23	25/2/47
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	52	26/6/47
Aboriginal Station, Wallaga Lake	19	29/4/47
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	3	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	27	16/2/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	19	1/5/47
Orange Mental Hospital	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
Rolfe, V. J., "Mount View," Inverell ...	18	9/2/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter ...	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook ...	54	12/5/46
Youth Welfare Association of Australia ...	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief Division of Animal Industry.

Poultry Notes—*continued from page 109.*

The emulsion is made by dissolving ½ lb. of finely cut household soap in a gallon of boiling water and then adding slowly 1 gallon of kerosene, stirring briskly all the time to incorporate the oil thoroughly with the soapy water. This forms a stock solution and should be added to 8 gallons of soft water, making 10 gallons of spray.

The best means of applying the spray is to use a force pump and direct a fine spray into all the crevices of the houses, both inside and outside, including the floor, roof and nests. Where there is a heavy infestation two or three sprayings at intervals of about five days may be necessary to eradicate the pest. A stirrup pump with a long length of hose is suitable for the purpose; where large houses have to be treated the pump could be operated by one person while the other carried out the spraying operation.

Any litter on the floor of the houses should be saturated and then the house cleaned out, after which a further spraying of the floor should be made. Material, removed from a badly infested house, should not be placed near any pens or where the birds can come in contact with it, as any mites which might not have been killed by the spraying would live for some considerable time, and may cause a re-infestation of houses.

Provision of Shelter for Stock by Tree Planting.

AUSTRALIAN farming and pastoral areas are still suffering in many ways from the indiscriminate destruction of timber often practised by the pioneers (and many of their successors), and not least is this destrution to be regretted from the standpoint of the health of stock.

Shelter is a crying need on many Australian farms—shelter not only from the sun, but from rain and above all from winds. The need for it is too often evident both as regards cattle and sheep in open paddocks, and pigs in pens and yards. The circumstances of each farm will indicate how it can be provided. Trees, hedges, fences, and shelter sheds are some of the obvious indications.

Lack of shelter has an undoubted effect upon health. Over exposure to sun leads to dermatitis of various types, particularly if it is associated with the ingestion of certain plants. The manner in which all classes of livestock will crowd under an isolated tree in hot weather is a clear indication of the necessity for shelter.

Rain in itself is not of much importance in this country, but if associated with cold wind has very serious effects. It is shelter from wind that is most important. Hardly anything causes animals to cut up and lose condition and heart like prolonged exposure to a cold, moist wind. Pigs, particularly, are susceptible to its ill-effects and pneumonia is one of the commonest causes of death and unthriftiness in pigs. Such prolonged exposure to cold wind tends to reduce resistance to disease and to marked loss of condition. Still cold, as experienced in this country, has very little ill-effect.

The best months for tree planting are from May to August. Full directions for this operation are given in 'Trees on the Farm" (Farmers' Bulletin No. 167), which contains also a quantity of useful information on the subject of trees generally. It is obtainable from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, price 1s. 1d. (postage included).

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., "Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167
Hann, O., "Bomerah," Barrington (Jerseys)	55
Hawkesbury Agricultural College, Richmond (Jerseys)	96
Hicks Bros., "Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	141
McEachern, H., Tarcutta (Red Poll)	61
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., "Nareogullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	135
Robertson, S. H., "Turanville," Scone	90
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	9
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	72
Reid, D. B., "Evandale," Sutton Forrest	24
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

THE AGRICULTURAL GAZETTE FOR MARCH, 1947.

This Issue Contains:—

MARCH, 1947.

Editorial . . .

At Your Service!

VISITORS to the Royal Show this Easter will be struck by an entirely new set-up of the Department's Information Bureau. It will be staged in the northern end of the Agricultural Hall, which also houses the District Exhibits.

The Department's exhibits at previous shows may have led many to think (mistakenly) that they attempted to compete with the district exhibits as colourful and pleasing displays of quality produce.

This year the Bureau has been designed, on the one hand, to avoid any suggestion that the Department is a competitor in the field of production, and, on the other (and more importantly) to advertise the real purpose of the Department—*service to farmers.*

The district exhibits could not be excelled as collections of highest-quality products of the soil. It is fitting that the Department's Bureau should be housed close handy, as the message it aims to convey is: We can supply you with the advice and guidance which will enable you to produce quality products similar to those shown on the district exhibits.

A separate bay is allotted to each industry or aspect of agriculture which the Department serves. A large central map of the State graphically emphasises the extent to which the Department's services are decentralised. Each division of the Department aims to show how it can assist the farmer to increase his returns by raising bigger and better crops and more productive stock.

Expert officers will be in attendance for interviews on any aspect of the Department's services, and to discuss the agricultural potentialities of districts so well advertised by the district exhibits.

If you do not know what services the Department of Agriculture makes available, if you are not convinced of the value of those services, and if you do not know how and where to obtain those services, then the Department's Information Bureau at the forthcoming Royal Show will fully inform you on all these subjects.

Successful Stock Buying Mission.

Cattle, Horses, Sheep, Pigs and Goats Purchased.

The Minister's Impressions.

"I AM particularly pleased with the work accomplished overseas by the Stud Stock Delegation sent abroad by the State Government, which I had the honour to lead," said Hon. E. H. Graham, M.L.A. (Minister for Agriculture) when he returned to Sydney after having in three months travelled over 45,000 miles by 'plane, ship, train and car, in the course of which he visited England, Scotland, the Channel Islands, Denmark, United States of America and Canada.

Mr. Graham said he was very satisfied with the quality and type of stock the delegation purchased for the Government studs and private breeders. Stud stock was purchased in England, Scotland, Guernsey, Jersey, Canada and the United States of America, and included forty head of cattle (Ayrshire, Jersey, Guernsey, Aberdeen Angus and Friesian), twenty sheep, ten pigs, fourteen milch goats, and a Percheron stallion.

In his opinion, said the Minister, this was the finest consignment ever to be imported at one time into New South Wales, and he felt sure the stock raising industries throughout the State would benefit very considerably and over a substantial period as a result.

An Outstanding Ayrshire.

Among the purchases for the Department of Agriculture was the Ayrshire bull "Carnell Perfect Pilot" by "Auchenbrain Yours Truly" from "Carnell Peg." This outstanding bull was first and reserve champion at Ayr Show, 1946, and should develop into something really special.

The dam of this bull produced 9,500 lb. milk of 4.3 per cent. fat as a two year old and the grand dam "Drumfork Peg 9th" was champion at the London Dairy Show and the Royal Show of United Kingdom.

Jersey Cattle Bought in America.

In addition to the earlier purchases by the Delegation in the United Kingdom and the Channel Islands, said Mr. Graham, some outstanding dairy and beef stock had been bought while in United States of America and Canada for studs run by the Department of Agriculture. They included the Jersey bull, "Brampton Record Pinnacle," sired by "Brampton World's Record" whose dam is "Brampton Basilua," holder of the world's record for butter-fat production. The dam of the purchased bull ("Brampton Record Pinnacle") is "Brampton Pinnacle Princess" one of the highest producers in the famous Brampton herd.

Another bull purchased, "Bellevista Samaritan Royal," although only two and a half years old was a winner in his class and reserve grand champion at Lower Mainland, Calgary and Edmonton Exhibitions, being beaten on each occasion for grand champion by his sire, "Lindell Lady's Royal," winner of more than twenty-five grand champion prizes in leading Canadian Shows. "Bellevista Samaritan Royal" is backed by excellent production records.

The Aberdeen Angus Purchases.

Mr. Graham said he was confident that the Aberdeen Angus cattle purchased would attract much attention. They included the bull "Eblinettes General of Ada," sired by "General of Ada" from "Ablinette of Ada." This bull was a splendid type and of excellent conformation, with good head, perfect topline and tail-setting and hindquarters which would be difficult to fault.

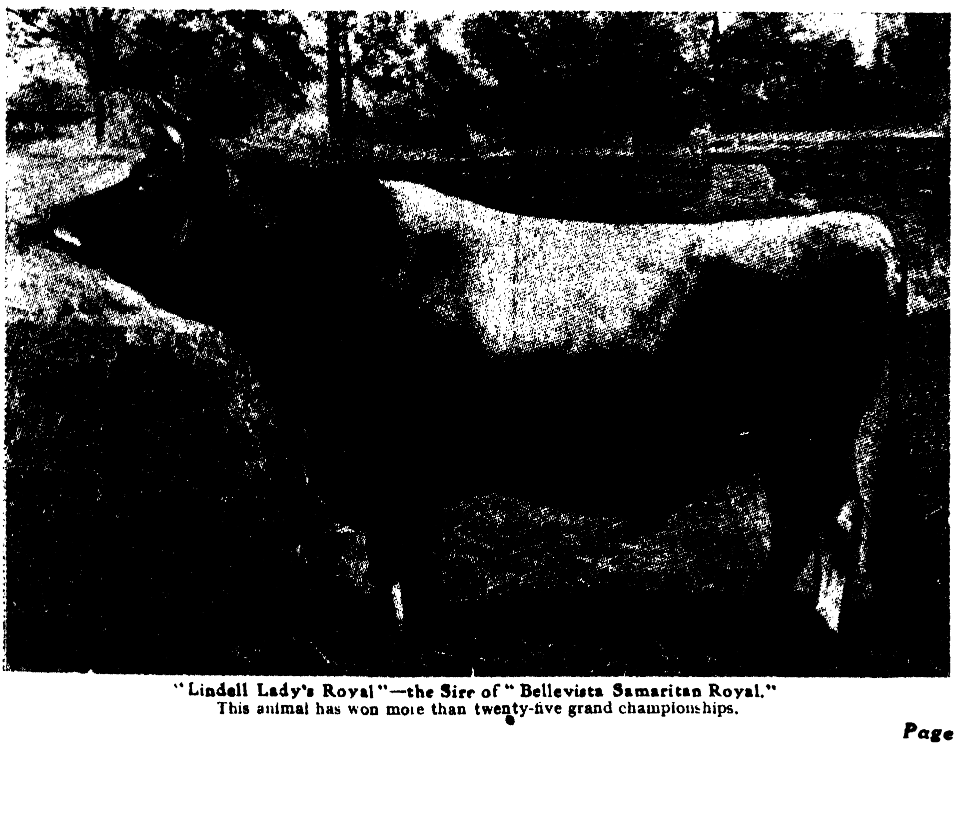
The Aberdeen Angus heifers purchased were uniform and typical of the breed. They included "Blackwood Glencarnock 6th" (junior champion at the recent Brandon Show) and another show winner in "Craven's Revolution-Blackcap 7th." Another four heifers made up a team which, Mr. Graham was confident, would be admired by all Aberdeen Angus breeders in this country.

The breeding of "Blackwood Glencarnock 6th" was of particular interest, as this heifer was sired by "Black-Bandolier 2nd," a full brother to the bull which is considered the best breeding Aberdeen Angus bull in America to-day.

Another Jersey Bull Purchased by the Stock-buying Delegation headed by Hon. E. H. Graham.

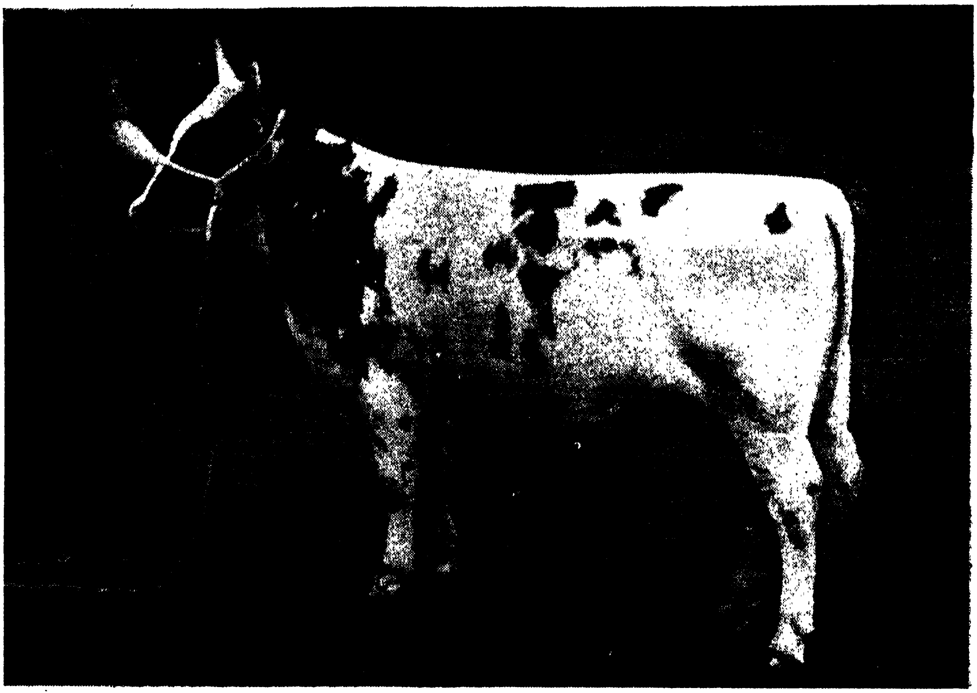
Young Jersey Bull "Bellevista Samaritan Royal" purchased by the Delegation.

Although only two and a half years old this bull was reserve champion at Lower Mainland Jersey Show, and at Edmonton and Calgary Exhibitions—being beaten for grand champion on each occasion by his sire. This bull is backed by excellent production records.



"Lindell Lady's Royal"—the Sire of "Bellevista Samaritan Royal."
This animal has won more than twenty-five grand championships.

An Outstanding Ayrshire Bull for the Department.



Carnell Perfect Pilot—Purchased by the Delegation for the Department of Agriculture.
This outstanding young bull was First and Reserve Champion at Ayr Show 1946. He is by Auchenbrain Yours Truly from Carnell Peg.

Carnell Peg—The Dam of Carnell Perfect Pilot.
This cow produced 9,905 lb. milk of 4·3 per cent. test as a two year old. The grand-dam Drumsfork Peg 9th was Champion at London Dairy Show and the Royal Show of United Kingdom.

BALING PEA VINE HAY

To Make Valuable Fodder for Dairy and Other Stock.

The Method Described.

R. C. MADSEN, H.D.A.,
Agricultural Instructor.

A "Self-feeding" Automatic-threading Pick-up Baler Handling Partially-dried Pea Vine Residue from Windrows.
Capacity 3 tons of bales per hour.

PEA vine residue, a by-product of the canning pea industry, is a valuable stock fodder, having a high protein content comparable with that of average lucerne hay. It consists of pea vines and empty pods which have passed through a vining machine or, in the case of frosted crops unfit for canning purposes, vines and full pods.

Sydney metropolitan dairymen and other stockowners should benefit considerably as the result of the foresight and ingenuity of two young farmers—the Marriott brothers of Millthorpe, near Orange—who, after considerable experimentation and the purchase of expensive machinery, have practically perfected the baling of pea vine hay.

The Advantages of Baling.

For some time it has been considered that the ideal form in which pea vine residue could be handled would be as baled hay. In this form it could be most profitably utilised by those who have most need of such valuable fodder, and who need simplicity of handling to reduce labour costs.

It was realised, of course, that to bale pea vine residue satisfactorily many difficult problems would have to be solved. The chief of these were:—

(*a*) How to handle the large quantity of vines being ejected by the vining machines.

(*b*) How to spread and dry the material quickly so as to prevent moulding and waste.

(*c*) How to bale the partially dried material without losing the most valuable leaves and empty pods, and so preserve the high protein content.

(*d*) How to handle the material during adverse (wet) weather conditions.

Fortunately, by trial and error and careful thought on the part of the farmers concerned, most of these difficulties have been overcome and now a first class product is available for those who need a high protein content fodder for use during the winter months. However, adverse (wet) weather conditions still present a real problem.

The Protein Content is High.

The necessity for preserving the high protein content will be appreciated no doubt when it is stated that pea vine residue (in the form of hay) compares favourably with lucerne in that it contains approximately 12 per cent. protein as compared with 15 per cent. in average lucerne hay. It is certainly superior to oaten and wheaten chaff which contain about 6 per cent. protein. It is this protein content that makes the material so valuable for dairy cattle, especially when only protein-poor feeds such as oaten or wheaten chaff or cereal grains such as crushed wheat or crushed oats are being fed, or where protein-rich feeds such as

lucerne hay or linseed meal are expensive and scarce.

The high feeding value is now fully appreciated by a large number of stock-owners, including dairymen, in the Central Tablelands and Central Western Districts of New South Wales. This year, due mainly to severe drought conditions, the demand for the material has been so great that it has been necessary to resort to rationing. However, it is to be hoped that such adverse conditions in these areas will not have to be tolerated for much longer, nor again for many years, and the demand for the material will no doubt be reduced, thus making a greater quantity of baled material available for the metropolitan dairymen and others whose need for such valuable fodder is known to be great and constant.

Baling the Residue.

Messrs. Marriott Bros. are fortunate in that they have a 25-acre paddock adjacent to the vining station at Millthorpe.

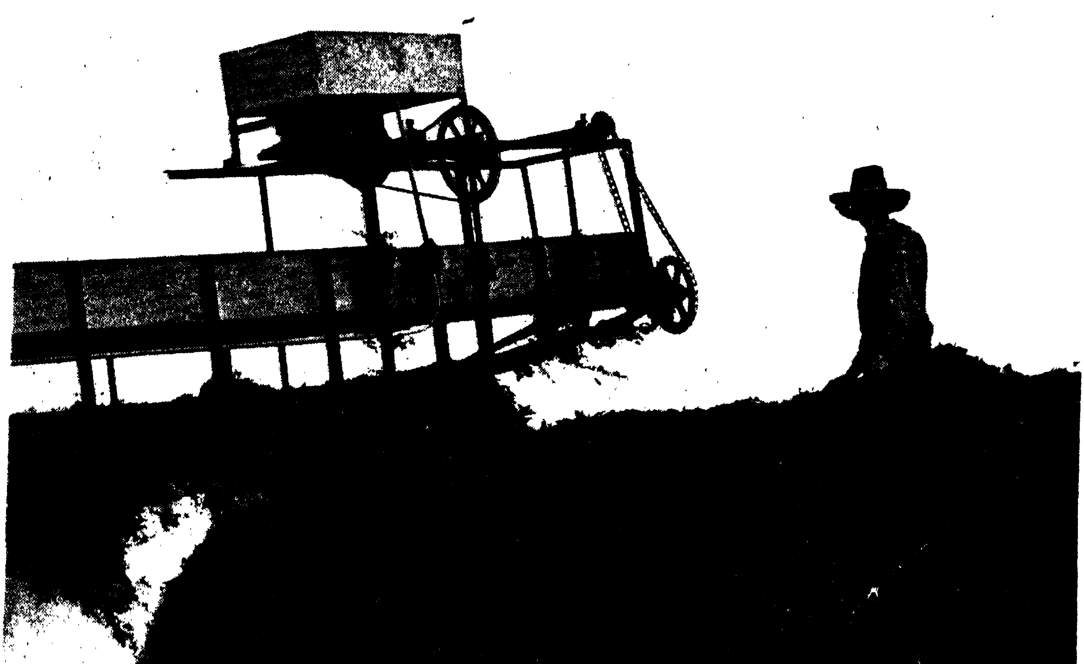
They usually operate two heavy lorries from the vining station. Whilst one is being unloaded in the paddock the other is being loaded at the vining station.

Each lorry is unloaded in the paddock by two men, who fork the material off on either side, whilst the lorry is moving slowly. It is essential that the material be unloaded as evenly as possible so as to avoid large heaps being left on the ground, as such may readily "mould" or go "mushy," which seriously affects the quality of the finished article.

It is considered that approximately 125 tons of fresh vines can be evenly, yet lightly spread over the 25-acre paddock at one time and this quantity could be made up into approximately 35 tons of prime baled pea vine hay.

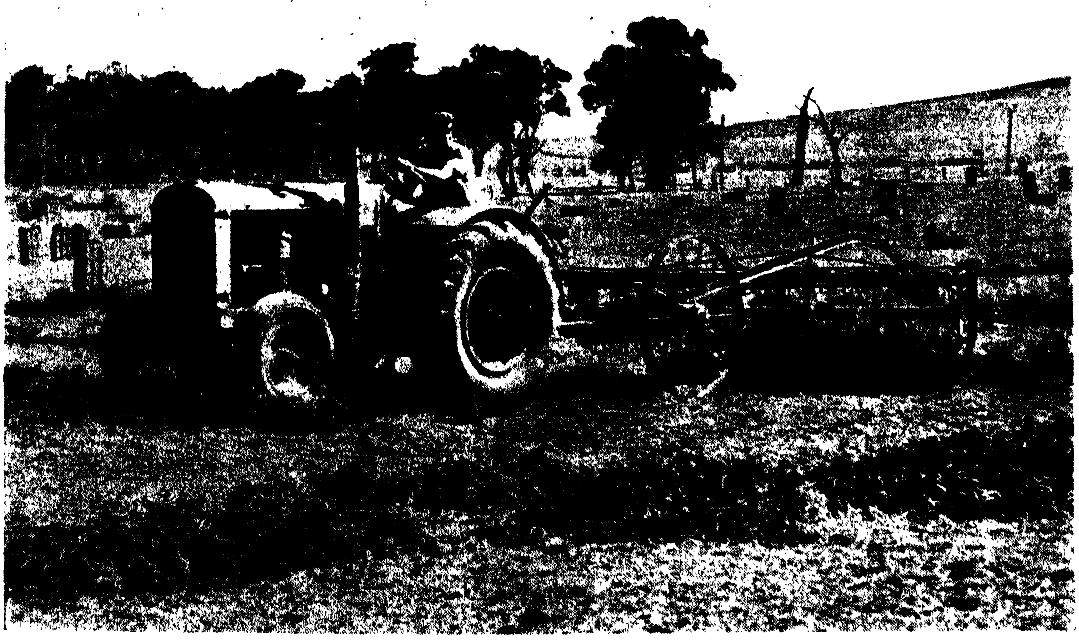
As soon as possible after the residue has been unloaded in the paddock in windrows, a tractor-drawn, side-delivery rake is used to "ted" the material into a thin layer, so as to hasten the drying process.

When the material has dried out sufficiently (up to four days, depending upon the weather) it is raked into windrows, and finally picked up and baled by a two-man-operated, "self-feeding," automatic-threading pick-up baler drawn by a tractor, which machine is capable of turning out approximately 3 tons of bales per hour. The bales



Pea Vine Residue Being "conveyed" from the Vining Machines to a Lorry.

A Lorry Load of Pea Vine Residue Being Unloaded on Both Sides, in a Paddock Adjoining the Vining Station.



A Tractor-drawn Side-delivery Rake "Tedding" the Rows of Fresh Pea Vine Residue, so as to Ensure the Most Rapid Drying.
The same implement is used to rake the partially dried material into windrows ready for baling.

Rear View of a "Self-feeding" Automatic-threading Pick-up Baler, showing the Operator Cutting and Tying the Baling Wire, and the Bales of Hay Being Ejected.

Baled Hay being Unloaded and Fed to Sheep

Note the excellent condition of the sheep. Sheep like other stock, including dairy cattle, lose no time in eating all the material. Only a little patience is required on the part of the stockowner in breaking stock into eating this hay.

are then loaded and either stacked or trucked.

From practical experience, Messrs. Marriott Bros. have found that the best job can be made by baling from dawn until about 10 a.m., whilst there is some dew on the vines. After this time it is considered that the vines become too dry and brittle, and too

many of the valuable leaves and empty pods are lost in handling.

If rain falls whilst the material is drying then it may be necessary, depending upon the amount of rain, to "re-ted" the material so as to ensure satisfactory drying. A risk is involved if heavy or prolonged rain falls as the material is easily damaged by such a condition, and it may then have to be utilised in some other form possessing a lower protein content. If weather conditions prevent the material being baled within four days, it should be utilised in some other form.

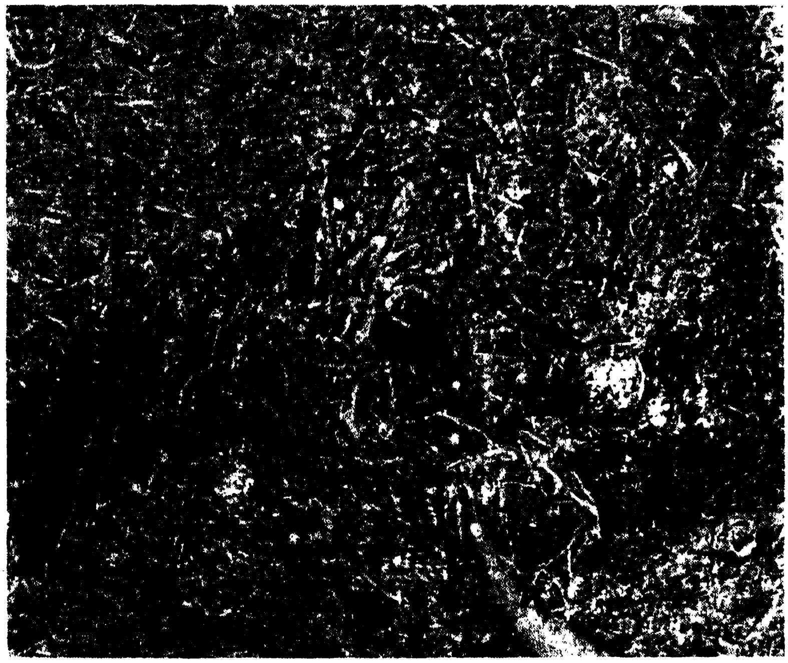
The Bales.

Each bale, which is wired, measures approximately 36 inches by 14 inches by 18 inches, and, depending upon varying circumstances, approximately 22 to 30 bales make up a ton.

The bales are stacked and covered if required for own use during winter months, or may be railed direct to metropolitan dairymen or others with speed and comparatively little effort.

The Manpower.

The number of men required to carry out all the operations is surprisingly small, mainly because mechanisation is being utilised to the fullest extent. At a busy time approximately nine men are required for all operations.



A Close-up View of Portion of a Bale of Pea Vine Hay, showing how Easily and Clearly the Bale opens up in "Leaves," which Simplifies Feeding to Flock.
Note the leaves and empty pods.

Metropolitan dairymen and others are well advised to become actively interested in this new, valuable form of fodder, the cost of which should be well within their means.

Indications of Good Lucerne Seed.

LUCERNE seed should be bright, fresh to the smell, and of a yellowish-green colour, these characteristics indicating that it is not old seed; the latter can nearly always be picked by the absence of a good smell, and a brown, "aged looking" colour.

Provided it is properly stored, lucerne seed retains its viability for a considerable time; seed two or three years old may germinate nearly as well as new seed, but it may not have the vigorous and rapid germinating ability of the latter.

When purchasing lucerne seed, examine it closely for shrivelled and cracked grains if it has been produced in a dry climate, whilst samples containing weed seed should be looked at askance, especially if the lucerne is to be grown under irrigation.

Investigation of New Zealand Methods of Wheat Research.

MR. J. R. FISHER, Analyst-in-Charge of the Cereal Section of the Chemist's Branch, New South Wales Department of Agriculture, is at present in New Zealand investigating the set-up and work of the Wheat Research Institute at Christchurch.

Whilst in New Zealand last year, Hon. E. H. Graham, M.L.A., Minister for Agriculture, made a proposal to the New Zealand Government for the interchange, for periods of two or three months, of technical officers in the New Zealand and New South Wales Departments of Agriculture.

The information which Mr. Fisher would bring back from New Zealand, said Mr. Graham, would be of value in planning a cereal chemistry section of the wheat research institute to be established in New South Wales.

It was hoped, when Mr. Fisher returned, said Mr. Graham, to arrange for a New Zealand cereal chemist to spend some time with the New South Wales Department of Agriculture.

Such interchanges would aid both countries to develop their agricultural industries. Pasture improvement, fat lamb production, dairying and poultry were particular aspects which he had in mind, said the Minister.

Potato Board Election.

NOMINATIONS for election to the Potato Marketing Board closed on 14th February. The Returning Officer for the Poll, Dr. H. J. Hynes, states that the following persons were nominated for election:—

Electoral District No. 1.
David James Barr, Bellingen.
Joseph Dudden Kirby, Woodford Dale.
Charles Edward Summerhayes, Dorrigo.

Electoral District No. 2.
Harold Alfred Swane, Liverpool.

Electoral District No. 3.
Harold Starr, Guyra.
Augustus Francis White, Black Mountain.
James McPhail Youman, Black Mountain.

Electoral District No. 4.
Irvine Collins Hood, Newbridge.

Electoral District No. 5.
William John Lowe, Roslyn.
Bertram Alexander McPaul, Crookwell.

As only one nomination was received for each of Electoral Districts Nos. 2 and 4, the candidates, Messrs. Swane and Hood, were declared elected to represent those districts.

A poll will be taken by postal ballot on 12th March for the election of one producers' representative for each of the Electoral Districts Nos. 1, 3 and 5. Ballot-papers for voting have been posted to all enrolled producers.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Armidale	March 13, 14, 15
Crookwell	March 13, 14, 15
Castle Hill (Patricia McMullen)	March 14, 15
Dapto	March 14, 15
Gloucester	March 14, 15
Manilla	March 14, 15
Molong	March 14, 15
Campbelltown	March 15
Dunedoo (E. G. Stone)	March 17
Blayney (K. Gresser)	March 17, 18
Tamworth	March 17, 18, 19
Taralga	March 17, 18, 19
Warialda (L. Rolfe)	March 18, 19
Delegate	March, 19, 20
Mendooran (J. H. Sheedy)	March 20
Camden (G. F. Sidman)	March 20, 21, 22
Goulburn	March 20, 21, 22
Gresford	March 21, 22
Bingara	March 21, 22
Quirindi	March 21, 22
Coonabarabran (L. J. Failes)	March, 25, 26
Cumnock	March 26
Muswellbrook (F. N. Ross)	March 26, 27
Baradine (—. Allen)	March 28
Brookvale	March 28, 29
Bulahdelah	March 28, 29
Sydney R.A.S. (G. C. Somerville)	Mar. 29 to Ap. 9
Kendall	April 11
Stroud (Miss J. Neville)	April 11, 12
Gunnedah	April 16, 17, 18
Kempsey	April 16, 17, 18
Bathurst	April 17, 18, 19
Hawkesbury	April 17, 18, 19
Macksville	April 18, 19
Bellingen (C. P. Franey)	April 22, 23
Orange	April 22, 23, 24
Narrabri	April 23, 24
Wallamba	April 23, 24
Grafton (C. W. Creighton)	April 24, 25, 26
Horsley (J. Hill)	April 26
Wellington	April 29, 30
Bonalbo	April 30, May 1
Forbes	May 2, 3
Dubbo	May 5, 6, 7
Gulargambone	May 10
Coonamble	May 13, 14
Trangie (R. R. Bailey)	May 20, 21
Walgett	May 22, 23
Walbundrie (C. Leischke)	October 1

Black Headland Soils of the South Coast.

Unusual Process of Formation.

N. H. PARBERY, D.Sc.Agr., Analyst.

THE localised black soils of high organic matter content which occur on certain headlands on the South Coast of New South Wales are a distinct, if restricted, type produced by the inter-action of sea and vegetation, irrespective of local geological formations.

Although such soils in the Moruya district had long been observed by the author, the regular occurrence of similar black or grey-black soils on all favourably located coastal promontories, noted during a soil survey of the Illawarra district, served to impress the significance of the soils.

The observations and descriptions of the black headland soils are of passing scientific interest and their limited occurrence and exposed situation restrict their use for farming or grazing.

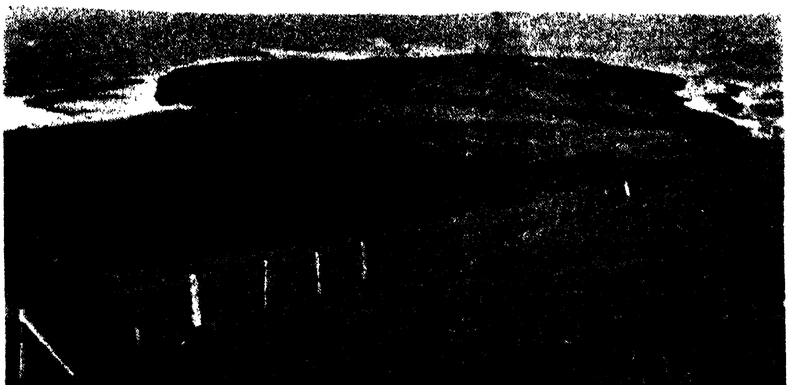
That the colour of the soils, deriving from the high content of organic matter, did not fail to impress the earlier cultivators of some of the headlands is shown by the name, Black Point, given to the most extensive development of black headland soil in the Illawarra, and situated 2 miles south of Gerringong.

Association with Westringia.

The black headland soils were associated during the period of their development with a low spreading shrub *Westringia rosmariniformis* which is densely covered with narrow, harsh, lanceolate leaves. These black soils attain their best development on the southern slopes of headlands, but it is essential that the headland be exposed to the full force of southerly weather. On the South Coast southerly weather is the most tempestuous and during gales, sea spray adds to the water regime of the soil. The southerly situation, with this additional water income and lowest evaporation rate, ensures a more regular soil water supply than any neighbouring situation where drainage is satisfactory.

Influence of Geological Material.

Geological material giving rise to heavy-textured and well-based (high calcium magnesium, potassium) soils contributes to the



Black Point.

A favourable situation for the development of a black headland soil from stratified fossiliferous tuff.

accumulation of considerably greater amounts of organic matter in the black headland soils, than in nearby soils derived from the same rock material but slightly removed from direct oceanic influence.

Bass Point immediately south of Shellharbour projects about 2 miles and is ideally situated for the development on its southern slopes of a black soil. Its outer portion, however, consists largely of sandy heath in which there is no appreciable accumulation of organic matter, and only with a change in geology approaching its junction with the general trend of the coastline is there encountered on its southern slope, a shallow black soil with basalt rock at a depth of about 1 foot.

Black Point is unusual on the Illawarra coastline in its long axis lying north and south, and, in consequence it receives uniformly, the force of southerly gales over its whole length. This fact results in the most even development of black soils of any of the coastal promontories, and about 60 acres of cultivated black soil comprise most of its surface.

The black headland soils, varying in texture from heavy loams to clay loams, are frequently not deep soils, the surface horizon extending to a depth of about 12 inches when overlying basalt, to 12-18 inches when overlying decomposed tuff or a yellow clay derived therefrom, and exceptionally to 24 inches when formed on schistose sandstone at Moruya Heads. Here dome-capped, rectangular, Solonetz-like columns of yellow schistose clay protrude into the overlying horizon of organic accumulation, but chemical examination has shown that these columns have no affinity with Solonetz.

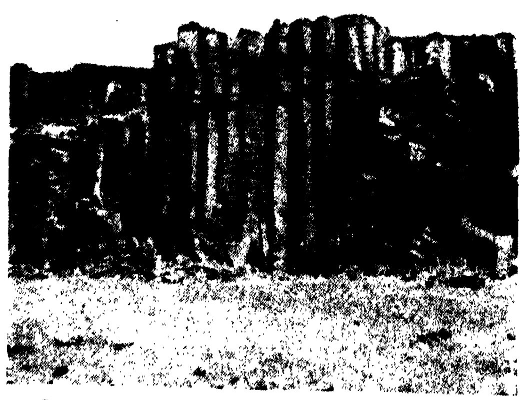
Organic Matter Content and Chemical Features.

The accompanying tables give details of organic matter content and other chemical features of samples of black headland soils. Soil samples consist of the 0-10 inches portion of the surface horizon.

Organic matter, Nitrogen, Salt Contents, and Reaction of Black Headland Soils.

Location.	Geological Origin.	Organic Matter.	Carbon.	Nitrogen.	Carbon : Nitrogen Ratio.	Salt (NaCl).	Reaction, pH.
		per cent.	per cent.	per cent.		per cent.	
Barrack Point	Tuff	13·00	7·54	0·454	16·61	0·02	5·6
Minnamurra Point ...	Basalt	14·60	8·47	·518	16·36	·04	5·55
Kiama Lighthouse ...	Basalt	17·99	10·43	·646	16·16	·05	5·7
Headland South of above	Basalt	17·60	10·20	·544	18·76	·02	5·45
Black Point	Tuff	10·76	6·24	·353	17·66	·01	5·45
Moruya Heads	Silurian schistose sandstone	10·29	5·97	·344	17·35	·08	5·7
Monaro Point, 8 miles of South of above... ...	Diorite-Gabbro ...	12·59	7·30	·412	17·72	·02	5·6

It will be seen that the heavier and better-based soils derived from basalt are a better medium for the accumulation of organic matter than the lighter-textured soils derived from the tuff or very ancient sandstone. The low salt content exhibited by all soils shows that the relatively high rainfall of the localities listed prevents an accumulation of salt and the lime and magnesium



Parent Material of Some Black Headland Soils
Columnar basalt in quarry face (about 60 feet high) at Kiama.

native to the soil and received regularly in sea spray prevent any important intrusion of sodium into the exchange complex. This feature will be observed in the following table showing exchangeable lime, magnesium, potassium, sodium and hydrogen expressed as Ways, and the proportion of hydrogen (degree of unsaturation) in the total of these cations. The proportion of sodium in the exchange complex is normal for agricultural soils in most parts of New South Wales.

Lighthouse soil with a C : N ratio above 16 had, at sampling, a moderate nitrate nitrogen content (26 parts per million of soil) and following a few weeks microbial activity in a moist sample at a room temperature of about 18 deg. Cent. the nitrate accumulated to the fairly high value of 72 p.p.m.

Occurrences North of Sydney.

No information is available concerning the occurrence of similar soils on the warmer North Coast of New South Wales. Slightly

Location.	Exchangeable Cations, Ways.					Cation Exchange Capacity, Ways.	Unsaturation.
	Ca	Mg	K	Na	H		
							Per cent.
Kiama Lighthouse	11·0	12·7	1·21	4·12	37·0	66·03	56·1
Moruya Heads	12·9	7·3	1·45	2·77	20·0	44·42	45·0
Black Point	8·4	6·3	0·84	1·80	23·2	40·54	57·2

The black headland soils are uniformily, fairly acid and in keeping with this feature they are moderately unsaturated. The high carbon : nitrogen ratio characterising the organic matter of these soils suggests that nitrogen might not become available at a rate ample for plant nutrition. The Kiama

Stratified Tuff in Cliff Face at Kiama.

north of Sydney on a headland of Wianamatta shale at the southern end of Monavale beach, vegetated with *Westringia* but not ideally exposed to southerly weather, there is a soil representative of the black headland type which contains 9.4 per cent. of organic matter. A grey-black loam derived from Narrabeen sandy shale and again associated with *Westringia* and with a southerly exposure immediately west of the base of the Skillion at Terrigal contains the moderate organic content of 6.9 per cent.

A Comparison with Organic Loams.

The organic loams which comprise the marsh soils bordering the Berry Swamp and some of the low lying areas near Gerringong contain the highest amount of organic matter (17-19 per cent.) among the Illawarra soils. The accumulation, in elevated situations with unimpaired drainage, of similar amounts of organic matter in some of the basalt-derived black headland soils, demonstrates that the combination of heath vegetation, favourable soil water conditions and the possible influence of the regular addition of salt spray has proved an unusual factor in developing soils of high organic matter content.

THE 1946 sugar harvest was almost double the previous cane harvest, and roughly equal to the immediate pre-war average. Tonnages crushed at the various mills were:—Clarence, 114,900 tons; Richmond, 117,300 tons; and Tweed, 77,500 tons.

THE MAKING OF SILAGE.

A Succulent Conserved Fodder

Suitable for Drought Feeding.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THE conservation of fodder as silage has much to commend it. Silage making is a process whereby succulent green feed can be preserved with a minimum loss of digestible food material for quite lengthy periods of time—or for as little as six weeks. In many cases the palatability of coarse feeds is improved (by chaffing, pressure and fermentation), while the digestibility of some constituents may be increased. Silage can be made successfully under weather conditions or from crops unsuitable for hay making. It could, if necessary, be made even in light rain, while crops such as maize and sorghums, which are not suitable for hay making but yield a greater bulk of material per acre than the small-grain cereals or legumes, can be used to advantage under conditions of good rainfall, or of irrigation.

Silage making increases the production possible from an area by allowing fodder to be stored when there is a surplus, against time of shortage—and also has the advantage that the product is not saleable, so that the fortunate possessor cannot dispose of it to his own ultimate disadvantage when good prices are offering for feed during drought periods. Silage is not subject to damage by fire or by mice, while, generally speaking, rain causes no damage to it, and provided reasonable care and attention to detail are given to the process, there is less risk of loss than in the case of hay making.

The product has a definite, though to a certain extent restricted place, in a fodder conservation programme, primarily as a drought feed in association with hay or stored grain and also as a supplement to the rations of milking stock (either dairy cows or calving stock) when the succulent pasturage required for milk production is short or only dry feed is available.

The Effects of Drought.

In Australia we have had more than our fair share of ruinous droughts, their history being reflected in the fluctuating figures of the number of stock and in numerous financial losses to our primary industries. The large decrease in stock numbers and the financial losses which accompany even mild drought periods could be lessened and even done away with completely by a vigorous and far-sighted fodder conservation programme. Today the margin of profit of the stock-raising industries is narrow and the financial position of very few farmers will withstand repeated stock losses through drought.

There is another aspect of the problem of droughts—less spectacular and not as generally recognised. Pasture, when young and actively growing, provides the cheapest and most satisfactory ration for stock, but the amount and nature of the growth of pastures under New South Wales conditions varies widely, even in good years. There is hardly a district in the State where stock can be fed their whole ration in this form throughout the entire year.

Need for Fodder Conservation.

The answer to these difficulties lies almost wholely in the adoption of a scheme of fodder conservation, coupled with pasture improvement in suitable districts to provide varieties of grass with a longer growing period. Surplus growth in a flush season should be conserved either as hay or silage, and the reserves so obtained supplemented by reserves from specially grown crops. The pastures actually benefit by this practice, while supplementary feeding with conserved fodder protects pastures from hard grazing during dry periods.

Hay has many good qualities as a conserved roughage. It has a low moisture content, and hence higher food value per ton of the final product, than silage. It has a resale value, can be handled with ease,

and nearly all stockowners are quite familiar with its handling and use as a feedstuff.

Advantages of Silage.

Silage, on the other hand is not transportable and has not the wide usages of hay. It needs supplementing with hay or grain for feeding to stock and it is not a generally suitable food for horses, although up to 15 lb. per head may be fed. Its advantages as a foodstuff are its succulence—making it ideal for milking stock or breeding females—and particularly, in the lower loss in food material when made under good conditions. Silage making is the only successful method of conserving the greenstuff of the heavy yielding summer cereal crops, maize and the sorghums. Because the crop is cut earlier than in the case of hay, the protein content is still high, allowing the preparation of a product high in this valuable food constituent. Provided the temperature is kept within the usual working limits the vitamin A content is preserved much more completely, which is a valuable consideration in the feeding of dairy stock.

The Processes Involved in Ensilage.

Crops for silage are cut while still succulent and containing plenty of sap, and except in the case of very watery crops such as kale, or cabbage, which are occasionally preserved in this way, are carted in before they wilt. Usually a reaper and binder or a maize binder is used, although a cane knife or mower may be used, the latter for cutting pasturage, or where no binder is available. The cut material is either carted or sweep-raked to the silo. Only as much crop as can be put into the silo in a day should be cut. Cutting should be done in the evening so that the crop will be kept in a moist condition by the early morning dews.

Once placed in the silo the plant material is compressed, firstly by the weight of subsequent additions placed above it and secondly by even tramping, either by men, or by horses or vehicles passing over it. This has the effect of expressing most of the air entrapped in the mass of cut fodder.

Although the plants have been cut they are still alive and carrying out their life processes, taking up oxygen from the air, "burning" it in the same way as they do when growing, and "breathing out" carbonic acid gas. This process tends to speed up after cutting, and the rate is also increased if the temperature is raised. The process goes on until all of the air entrapped in the mass is exhausted, and as the mass is compacted and insulated so that the heat involved cannot escape, the heap gets hotter in exactly the same way as does a manure heap or hay when stacked before properly dry.

As this heating is going on, the life processes of moulds and bacteria which are present on the leaves, are also speeded up, and the bacteria produce small quanties of acid as by-products of their activities, the process being similar to the souring of milk. At the same time the tissues of the plant are broken down to some extent by the chemical activity within them. Starches are changed in part to sugar, and the proteins undergo some breakdown so that the digestibility of the product is to some extent improved. The crushing and softening of the plants due to pressure and chemical action also make the mass more palatable and easily digested by stock.

Once the air entrapped in the green material is used up, the action of moulds ceases, although most of the bacteria which can live in the absence of air, continue to be active for a further time. At this period either the temperature of the mass has reached a high enough point to kill the plants and so prevent further heating, or else further activity goes on until the cells collapse and lose their vital characteristics. The activities of the bacteria produce little heat.

The amount of time during which this heating goes on depends upon the amount of air entrapped in the green material. If the crop material is thrown in loosely and not trampled, a large amount of air is entrapped, and the temperature rises higher than when well tramped and compacted, with consequent exclusion of air. The moisture content of the plants put into the silo also affects the degree of heating as sappier material can be packed better, and the general tendency is for dry material to heat more than plants ensiled at the correct moisture content which is about 75 per. cent. moisture.

The heating has three effects. The first of these is a softening of the plant tissues, which probably assists their compaction when weight is applied. The second has

been mentioned previously, that is, a speeding up of the life processes of both bacteria and other plant life present in the silo. These two effects both help in the production of a good silage.

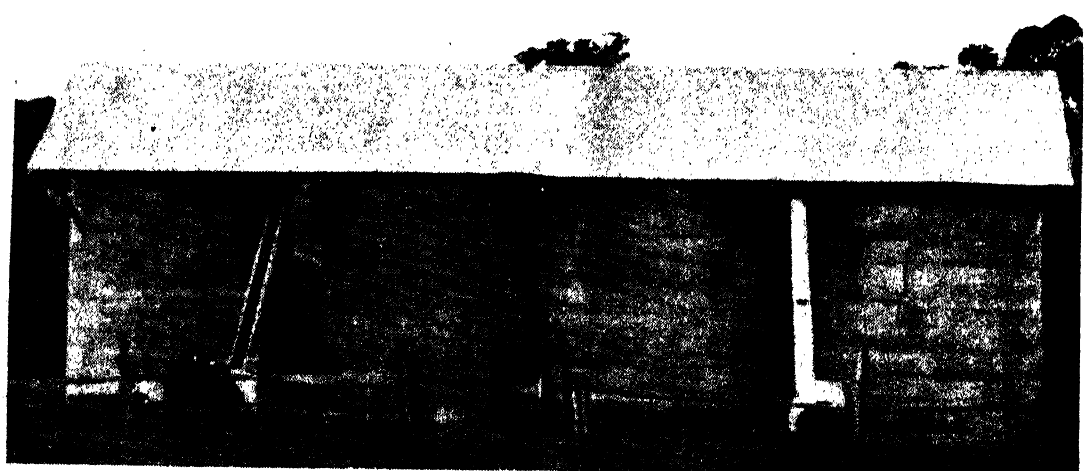
The third effect, however, is of a harmful nature, and in silage-making one attempts to minimise it as far as possible. In respiring and burning up the air, the plants, moulds and bacteria draw on the sugar reserves in the plant to provide energy, thus reducing the amount of foodstuff left in the finished product, and hence its value as a source of energy when fed. This source of waste is always present, but is kept as low as possible by doing everything practicable to assist the compaction—adequate tramping in particular, the addition of weights, and, in some cases, chaffing of the greenstuff. Another bad effect of heating when the temperature becomes too high, is that the foodstuffs in the plant, particularly the valuable proteins — are rendered less digestible.

The aim then, is to keep the temperature rise within as narrow a limit as practicable. It should never rise above about 120 deg. Fahr., and this is taken care of by careful stacking and tramping. On occasions, the temperature may rise very much higher than this, greatly reducing the digestibility of the product and in extreme cases blackening it and making it very unpalatable or even worthless.

The Production of Acids in Silage.

The preservation of crop material as silage is actually a pickling process similar to the preservation of pickled onions or gherkins in vinegar. The main preserving medium is lactic or milk acid, although acetic acid (the acid present in vinegar) is also found in reasonable concentrations in the finished product. These two acids are produced by the activity of bacteria present on the greenstuff when it is carted in from the paddock. They are always present in sufficient numbers to bring about fermentation.

As soon as the plant material begins to warm up, the rate of reproduction of the bacteria speeds up and acid is produced. As soon as the air is used up, the action of moulds, which, if allowed to grow unchecked, cause extensive spoilage and loss, ceases, and the bacteria are the only organisms left alive. These micro-organisms are able to live and produce lactic acid up to quite high temperatures—higher than those usually attained in a silo. The lactic, acetic and other acids produced by these useful organisms are not harmful, as they assist in the preservation of the silage and are digested by the animal when the silage is eaten. Their activity goes on, building up more and more acid in the mass until finally the amount is so great that it suppresses the activity of the bacteria producing it. However, in order that sufficient acid for preservation may be built up, the supply of sugar



Concrete Tub Silos.

in the plant material must be sufficient. This is attained when the plants are cut at the right stage of growth, although in some cases additions of sugar, usually in the form of molasses, are made. The final concentration of acids built up lies somewhere about 2 per cent. with properly prepared silage.

Spoilage in Silage.

There is a type of bacteria present on the greenstuff when it comes in from the field, which acts in a deleterious fashion if allowed to grow in the silage. This particular group is related to the organisms responsible for gas gangrene in wounds, and botulism. These bacteria can also live in the absence of air and can survive high temperatures, but they are unable to live in concentrations of acid present in a good or average quality silage.

To counteract the activities of these bacteria, it is essential that the concentration of acid in the product should be built up rapidly, so as to avoid low acid concentrations which favour them. Proteins and sugars in the plant are broken down through various agents, and if the spoilage bacteria are allowed to act on these, putrefactive changes are brought about, accompanied by the production of a foul-smelling, volatile acid known as butyric acid which can be frequently smelt when butter goes rancid, or in silage which has gone sour. This acid is to some extent repulsive to stock, and they will refuse silage containing any quantity of it, although the actual damage is due to the putrefactive changes referred to.

To assist in rapidly building up the acid concentration in the silage, the material used must contain sufficent moisture and sugar to allow the lactic acid bacteria to act rapidly. Chaffing and the application of pressure, by increasing the rate of exudation of sap, assist in achieving this object, and provided sufficient sugar and moisture are present, the activities of butyric acid producing bacteria are usually stopped within two days of manufacture.

With material deficient in sugar and moisture, two other methods of obtaining a rapid development of acid are used and will be described later. Briefly, they are the addition of mineral acids to the silage, and the addition of a cheap source of readily fermentable sugar, such as molasses, to the silage, dissolved in water to make a 1 or 2 per cent. solution, thus assisting the acid formers to make rapid growth. In some countries both acid and molasses are added.

Deterioration in Storage.

Once an initial acid concentration of about 1 per cent. is built up, and the air excluded, the material is effectively preserved for a long period. Silage in pits has opened up in good condition up to twenty-three years after ensiling, according to some records. The quality of the silage is found to be directly related to a high acid concentration in the final product. As already stated, the concentration of acetic and lactic acids in good silage would be about 2 per cent.

The two dangers that silage is subject to, once this acid concentration is built up, are water logging, in the case of pit and trench silos, and mould damage. Seepage water getting in through the soil will wash out valuable ingredients from the silage in trench or pit silos, while floods may cause damage also, especially if the soil is not properly filled and well banked up above ground level.

Once air gets into the silo, moulds and yeasts are introduced, and are able to grow, attacking the lactic acid. They feed on it causing a change in its chemical composition, and thus reduce the concentration. "Mouldy" silage in itself is repulsive to stock and can cause digestive trouble, but the reduction in acid concentration brought about in moulding also allows the putrifying organisms which have survived (in an inactive form) during the curing process to commence growing again, thus destroying the product.

Mould damage may also come about if the filling of the silo takes place intermittently. A certain amount of moulding always takes place at the surface of the silage or green material, where it is exposed to air. If material is placed in the silo and left for several days before later additions are made, a band of mouldy silage will be found in the final product, coinciding with the top of the first filling. Quick filling helps to prevent this source of loss, and also helps in compacting the material quickly, with consequent rapid exclusion of air.

Some loss is inevitable in silage making, through seepage and moulding. In a tower silo, for instance, the top of the silo to a depth of 6 inches or more becomes mouldy since it is in contact with the air. The mouldy material shrinks and is more pervious to air than compact silage, so the depth to which moulding goes on continues to become greater as time goes on. To overcome this loss, it is a common practice to top off a silo with rough material, such as frosted portions of the crop, which are of poor quality, poor weed and grass growth, or "cocky" chaff. The addition of weights, in the form of fence posts or sacks of soil also reduces the losses through mould action at the top of the silo. The practice of covering the silage at the top of a tower or pit silo with a cover of boards weighed down with soil or timbers, is carried out in some countries, and might be advantageous where the silo is not to be opened for some time.

Inspecting a Pit Silo at Gilgandra.

The compression of the material in the silo also squeezes out some of the sap from the plants in it, and this juice trickles down through the silo towards the bottom, collecting and forming a rather smelly, sloppy mess in the bottom layer. This juice contains material diss‹‹lved in it which would be useful as a f‹ ‹dstuff, if in an edible form, and this waste should therefore, be prevented as much as possible. When some portion of the crop that is being cut to fill a tower silo is drier than the rest, through frosting or greater maturity, it is an advantage if this can be placed in the bottom half of the silo rather than at the top. As it contains less moisture, dry material does not lose sap and frequently will absorb quite a lot of the juice from subsequent moister additions placed over it. Usually, however, practical considerations make it necessary for the drier material to be placed in last, because the crop is maturing during cutting, thus losing some of its sappiness.

(*To be continued.*)

A CONTINUITY of feed supply should be the aim of every dairy farmer. He cannot look to improved pastures alone to meet the situation, for the growth of pastures, even with the best of management, is largely dependent upon the seasons. The more the production of pastures is increased, the greater is the need for conserved fodders to equalise the supply of feed not only as between good and bad years, but throughout the different seasons of a normal year. The ideal combination for the dairy farm is fodder conservation, pasture improvement and the cultivation of fodder crops.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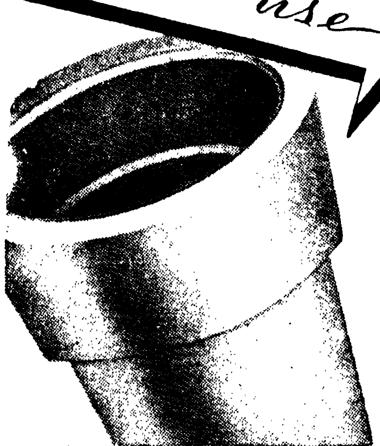
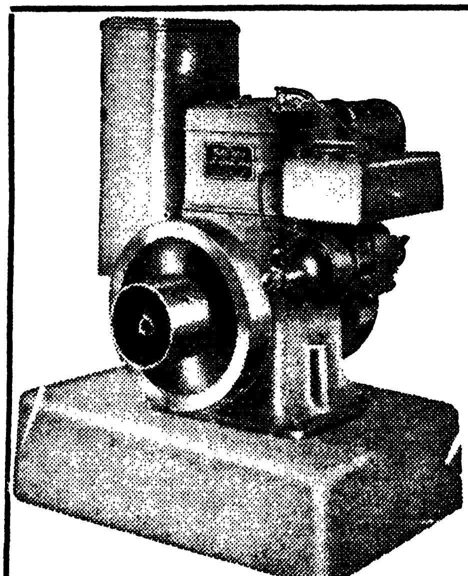




FRUIT GROWING.

MANURING OF CITRUS TREES.

R. J. BENTON, Special Fruit Instructor.

WHEN manuring citrus trees, it is necessary to vary the amount of fertiliser applied to suit the districts in which trees are growing and also the kind of citrus tree.

Generally, the basic materials from which inland soils have been derived are much richer than those from which coastal soils have developed, and, in addition, inland soils have not been leached to the same degree as coastal soils.

It appears from the meagre experimental data available that larger quantities of fertiliser are necessary for lemon trees than for oranges, particularly where conditions favour the lemons bearing continuous crops throughout the year. Emperor mandarin, if fertilised as heavily as oranges, tends to bear heavy alternate crops of small, low-grade fruit, and in extreme cases, the tree may "scald" in heavy cropping years.

Applications Required Inland.

As a result of the greater and more varied fertility of inland soils (and of the richer coastal loams also), the only fertilisers necessary in these areas are those containing nitrogen. This nutrient is most cheaply obtained in sulphate of ammonia, but other common sources of nitrogen are nitrate of soda, which contains about 16 per cent., blood and bone (from 5 to 7 per cent.), castor meal (4 per cent.), bone dust (3½ per cent.).

Large sized trees capable of bearing over 7 or 8 cases of fruit, should receive from 150 to 200 lb. of nitrogen per acre. To supply 100 lb. nitrogen per acre requires 500 lb. sulphate of ammonia, or 625 lb. nitrate of soda, or 2,000 lb. (5 per cent.) blood and bone, or 2,500 lb. castor meal, etc.

Coastal Applications.

In coastal soils, however, especially the light sandy loams, it is necessary that materials other than nitrogen should also be applied to citrus trees. Potash appears to be essential and probably other elements not yet considered important, such as magnesium, manganese, zinc and calcium, etc., are required.

Trees in coastal areas annually fertilised for a few years with single nitrogen fertilisers show an unhealthy appearance, and best tree health is apparent where growers use a variety of fertilisers and/or add new soil occasionally to their orchards. This better tree condition is the result of supply of other nutrients, in addition to nitrogen.

It is recommended, therefore, that mixed fertilisers should mainly be used for citrus trees growing in naturally poor soils—especially mixtures containing nitrogen, largely in organic form, and potash in addition. Care should be taken to ensure that the quantity of nitrogen applied per acre is as already indicated above.

Phosphatic Fertilisers.

Phosphoric manures are not apparently necessary for citrus trees, except in such quantities as are required for utilisation by green manure crops. It appears that the phosphoric acid needs of the trees are supplied during most of the year from residual quantities in the soil, and as this nutrient does not leach, its special application to citrus trees is unnecessary in any district.

Placement of Fertilisers.

Where citrus trees are thrifty and of mature size, it is probable that the root systems occupy the whole of the area of land. In such instances the fertilisers should be applied to the whole of the land.

In the case of young trees and also aged trees which are unthrifty, it is probable that the effective root system lies mainly in the area covered by each tree's foliage. In such instances, fertiliser applications should be confined to that area. Great care must always be exercised in distributing very evenly, highly concentrated fertilisers such as nitrate of soda or sulphate of ammonia, as uneven distribution may cause serious root injury.

Recommendations.

Apply to citrus trees grown inland from 150 to 200 lb. nitrogen per acre per annum on large trees. Apply a similar quantity to trees in less fertile soils on the coast, and in addition up to 2 cwt. of potash. In the latter area, variation in the form of nitrogen used each year seems advisable.

In all districts, encourage a growth of green manure crop—usually in autumn—by applying from 1 to 2 cwt. of superphosphate per acre.

Apply nitrogenous fertilisers in late winter or early spring. If a very soluble form of nitrogen is used in very permeable soils, divide the annual amount for application into two or three portions, applying them in early spring, summer and early autumn for preference, or at least in early spring and summer.

APPLE GROWING IN NEW SOUTH WALES.

(Continued from page 80.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

Pruning the Apple.

PRUNING is a process of direction and regulation of tree growth to suit the purposes of the commercial grower.

Contrary to a somewhat widespread belief amongst the uninitiated, pruning by itself has little to do with making the trees bear. Apple trees will bear fruit even if never pruned, but amongst other disadvantages they assume inconvenient shapes and sizes for economical working and tend to produce irregular crops of, mostly, unpopular and therefore unprofitable sizes. The primary object of pruning is to correct, as far as possible, all these faults.

A Well-grown 15-years-old Granny Smith Apple Tree.
Trained from planting along commercial lines.

Probably no phase of apple growing has given rise to so much controversy as pruning, but one important fact which is evident

In Favourable Locations Trees Receiving Little or no Pruning Become Large and Willowy.
Frequently too large for economical handling.

in all considerations of pruning is that no one stereotyped method of treatment is likely to be completely satisfactory throughout all districts of the State—or even throughout one district. Climate, stock, soil, age and vigour of trees, variety, etc., all have important influences on the methods of pruning to be adopted. Therefore the intelligent grower will treat his trees more or less as individuals, and adapt his pruning methods to the individual characteristics of

Granny Smith Trees Compared.

Left.—A tree pruned for five years by the hard cutting method.

Right.—Tree pruned for five years by a system of liberal treatment of laterals and leaders.

the tree and the needs of the crop in immediate prospect and future crops—up to two and even three years ahead.

Young trees in particular need special attention in the way of pruning. Apple trees tend to make their strongest growth in their early and unproductive years and, therefore, the time to ensure a good, large and solid framework to carry the future crops is during those years. After bearing commences, framework development still continues and the regulation of fruit bearing is added to the direction of wood growth. Both of these objectives can be achieved best by moderate and regular pruning which does not proceed according to some rule of thumb, but is based on understanding of the tree's habits of growth and tolerance of its inclinations.

Two types of pruning call for adverse comment. The first is the system of annual hard cutting adopted by odd growers here and there under the impression that the harder they cut the better their trees will grow, and the second is the system of practically no pruning at all, or, at best, spasmodic pruning. Both are extremes, but of the two the firstmentioned is possibly the more detrimental to the trees' health and cropping in the long run.

Hard cutting usually resolves itself into a system of over-heavy thinning out of new wood and cutting the remainder hard back to short stubs. If continued for a few years such a method can result in a serious stunting of the tree, and in the past has been an important contributing factor to the "stagginess" or premature ageing of apple trees. On the other hand, systems involving little or no pruning tend—especially in good soils—to produce trees too large and willowy for economic handling in the way of spraying, picking, etc., and there is a natural tendency towards alternate cropping as the trees get older. In the warmer areas also such trees sooner or later become badly sunscalded owing to the bending over of limbs under crop.

Whatever system of pruning is adopted the cardinal facts of tree growth should be kept in mind, namely that leaf production depends on root growth, root growth

depends on foliage area, wood growth depends on both leaves and roots; and in turn fruit production depends on all three factors. Thus all are indissolubly linked together, and therefore any system of indiscriminate cutting which ignores these facts is unlikely to lead to a satisfactory outcome.

Reworking of Apple Trees.

Large numbers of trees of non-commercial varieties have been reworked in New South Wales in the past decade or two, but there are still many which could with profit be grafted to better varieties. Although high prices for fruit tend to make this need less obvious, it is certain that the future can be faced more confidently when the orchard is producing only the best varieties.

A variety may be non-commercial in a particular area, not because it is out of date, but because it is misplaced and not doing its best in that particular place.

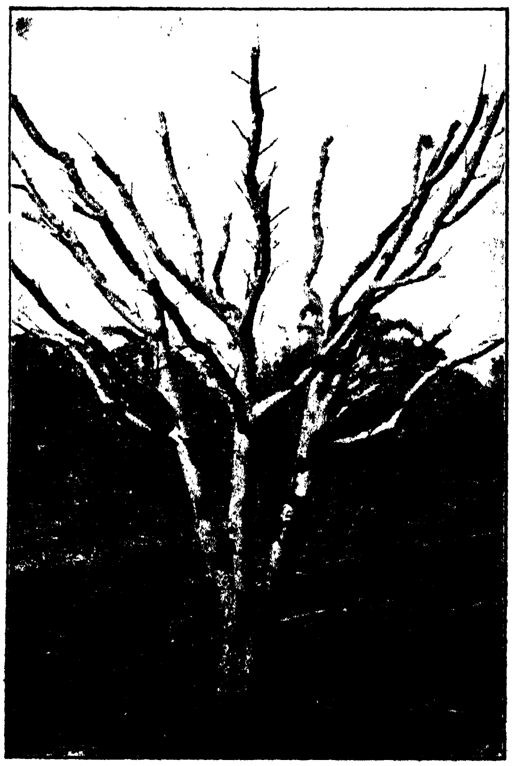
Grubbing out may be the only wise course when the trees are weak, stunted or in a distressed condition, or when the site is seriously eroded. Attempts to rework such trees are not likely to succeed. If the trees are vigorous and healthy, one or other of the various systems of reworking which have been tried and proved can usually be confidently recommended.

Systems and Methods of Reworking.

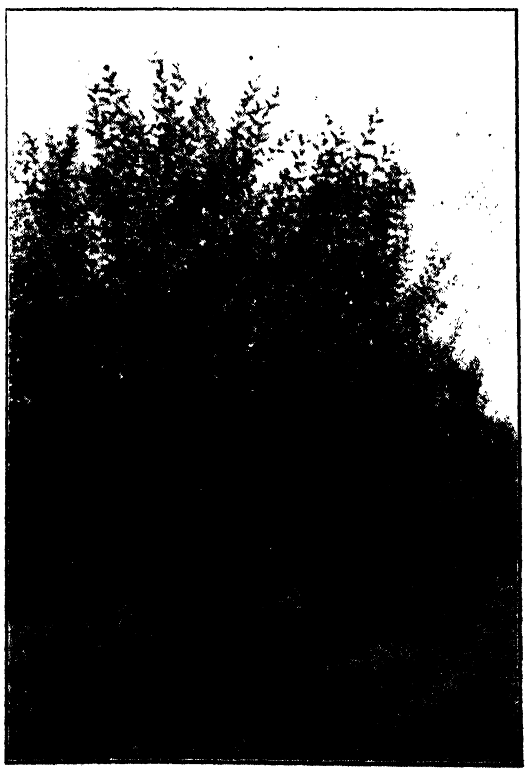
Two systems of reworking may be employed in changing one variety to another, viz. (*a*) stump-grafting, (*b*) re-furnishing.

In stump-grafting the tree is de-headed to within 2 or 3 feet of the ground, and the stubs of the main limbs grafted by means of the strap graft, supplemented by bark grafts. The method is simple and expeditious, but in most areas the severe de-heading necessary is frequently a predisposing factor to the invasion of one or other of the wood rot fungi, and also it is usually anything from five to seven years before the new tree can be brought back to satisfactory bearing again.

With the re-furnishing method the main framework of the tree is kept intact, the



Fameuse Worked to Delicious.
The top of each limb has been strap grafted, and the remainder of the tree side grafted.



The Same Tree Four Years Later.

A Stump-grafted Tree.
Note the number of scions used and foliage left below grafts.

limbs being only cut back a relatively short distance and then grafted. In addition to the ends of the main limbs, grafts are inserted at intervals of a foot or so throughout the rest of the framework, small limbs and lateral growth being used, or where such are not available the graft may be inserted directly into the main limb itself. Such a method naturally takes considerably more time to do, but against that is the fact that refurnished trees, if handled correctly during subsequent pruning, can be brought into bearing again in approximately two to three years, or less than half the time required for stump grafts.

In addition such trees are not as susceptible to wood rot infection; thus the advantages far outweigh the single disadvantage of increased cost.

A recently published leaflet entitled "Reworking Apple and Pear Trees" is available from the Division of Information of the Department of Agriculture. It is up-to-date and describes fully the methods which have been widely and successfully used in this State.

The Control of Pests and Diseases.

The control of parasitic diseases and pests is one of the major jobs on any orchard. The efficient orchardist should make himself acquainted with the more common troubles and the life histories of each in order to appreciate the necessity for varying the control measures according to the particular disease or pest to be dealt with.

Indiscriminate spraying is useless—the first step in plant troubles is diagnosis, so that appropriate measures may be taken. Insecticides, as a rule, are of no use against fungous diseases, nor are fungicides generally of use against insects.

Effective spraying calls for the use of a good spray pump and satisfactory material, but it also involves a knowledge of the enemies to be treated and of the remedies found to be most effective, the preparation of these remedies, and the proper time for their application. Spraying will prevent most fungous diseases, but it will not cure plants which are already badly affected. It will not restore the leaves after they have been eaten off by caterpillars—though by removing the caterpillars it may allow a tree or plant to put forth further growth. Nor are the best results always obtained the

Granny Smith Apple showing Chemically-treated Codling Moth Band in Position.

first year, especially when spraying for fungous diseases.

Success in spraying will only be obtained by thorough attention to details. The spray must actually reach every point which it is intended to protect or every insect it is intended to kill. The use of nozzles suited to the various sprays and to the result desired is important. Contact insecticides should, in most cases, be applied in a drenching manner with a coarse nozzle and a high pressure; fungicides and stomach poison insecticides can be applied with a fine nozzle as a mist-like spray and the nozzle need not be held so close to the object. With either type of nozzle, however, thoroughness of application is the important point.

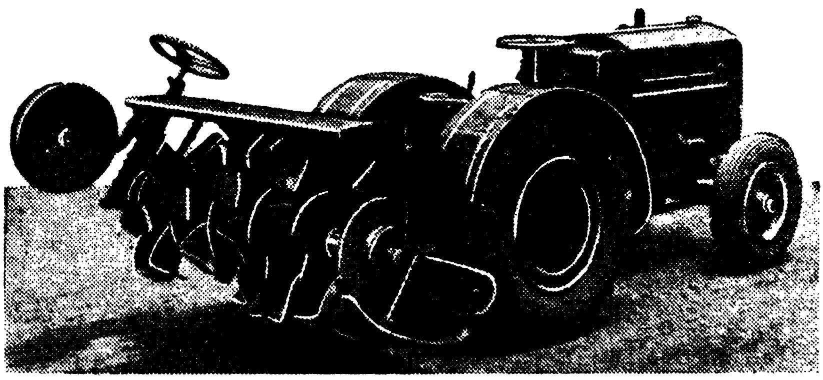
Spraying for the control of Pests and Diseases on a Large Batlow Orchard.

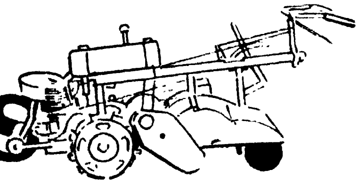
The Type of Tractor-drawn and -driven Spray Outfit used on Large Properties.
Effective control of orchard pests calls for adequate equipment.

Orchard Sanitation.

Many growers are content to depend on spraying alone to control the various diseases and pests, but in many instances, orchard sanitation measures designed to prevent the spread or carry-over from one season to another of fungous spores or insects, play

(*Continued on page* 151.)





Seed Wheat, Oats and Barley for 1947 Sowing.

List of Growers of Approved Seed.

IT has been decided to publish again this year a list of growers of approved seed wheat, oats and barley who have supplies available for sale. The crops of the growers listed were inspected by officers of the Department and reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

Wheat.

Apollo.—

Coddington, C. E. & A. R., Moulton Farm, Harden.
Kendall Est., B. W. J., Lulworth, Murrumburrah.

Baldmin.—

Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Trengrove, C. D., "Hillview," Koorawatha.
Watson Est. E. W., South Greenbank, Thuddungra, Young.

Baringa.—

Capps, A. E., & Sons, Wynfield, Cowra.
Amos, A. J., "Rockdale," Cowra.

Bencubbin.—

Stewart, J. M., "Bygoo," Ardlethan.
Stewart, J. L., "Meroola," Ardlethan.
Hawthorne, J. W., "Uley," Ardlethan.
Elder, J. L., "Rockhall Mains," Kamarah.
Carroll, F. J., "Killara," Ardlethan.
Richens, T. E., "Warrawee," Ardlethan.
Turnbull, J., & Son, "Sherwood Park," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Hawthorne, F. A., "Uley," Ardlethan.
Ballantyne, G. G., "Clifton," Ariah Park.
Renshaw, C., "Boogadah," Binnaway.
Heath, H. H., "Eugildry," Leadville.
Rowbotham Bros., Box Valley, Dunedoo.
Sullivan, T. P., Dunedoo.
Hookway, S., "La Questa," Leadville.
Deutcher, Les., Eden, Birriwa.
Ewin, C., "Fenella," Birriwa.
Granger, F. H., Black Hill, Birriwa.
Cummins, Est. P., Broula, Cowra.
Marshall, A. O. & B. C., "Pinelodge," Canowindra.
Ward, G., "Girrawheen," Grenfell.
Keir, J. A., "Braeside," Grenfell.
Wood, K., "Boongalla," Rocky Glen, via Coonabarabran.
McEvoy, J., "Levuka," Gugaldie.
Howe, K., Bungowannah.
Ross, R. D., Brocklesby.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Hutson, F. O., Walbundrie.
Adams, A. H., Farm 161, Stoney Point, via Leeton.
Amos, A. J., "Rockdale," Cowra.
Ashworth, E. J., Landawne, Bathurst Road.
Arnold, R., Farm 19, Corbie Hill Road, Leeton.

Bencubbin.—continued.

Baker, M., Temora.
Blythe, D., North Groongal, Carrathool.
Bowditch, C., Farm 1390, Hanwood.
Boxsell, L. B., "Cherry Wood," Cullinga Mines, via Wallendbeen.
Carey, J. & Sons, Numalla, via Trundle.
Cuthbert, H. H., Grong Grong.
Cooper, S. J., Rock Dale, Barmedman.
Davy's Plains Pty. Ltd., Cudal.
Davidson, D., Calitris, Young.
Denyer, A. N., Mimosa Road, Temora.
Davis, O. P., "The Pines," Gumble.
Dickie, Mrs. A., Box 106, VV, Griffith.
Edwards, J., Eglington.
Elliott, H. O., "Fairfield," New Grenfell Road, Forbes.
Forsythe, J. G., "Gwandolan," Cootamundra.
Hart, J. K., Lagoona, Galong.
Herbert, T. J., "Carnarvon," Road Mail Box 519, Leeton.
Johnson, R. R., "Umarla," Forbes Road, Grenfell.
Jones, E. G., "Renee Vale," West Wyalong.
Killick, K. P., Illawa, Galong.
Kelly, W. G., "The Oaks," Barmedman.
Kendall Est., B. W. J., Lulworth, Murrumburrah.
Love, R. B., "Yarrabundle," Trundle.
Marchington, S., Box 618 KK, Griffith.
McDowell, E. J., Purlewaugh, Ulamambri.
Mullens Bros., Goragilla, Binnaway.
Michalk, G. B., "Westwood," Eugowra Road, Parkes.
Mailer, R. V., Trundle Park, Bogan Gate Road, Trundle.
O'Neill, W. A., "Yarra," Cowra.
O'Neill & Bowlding, "Frogmore," Est., Frogmore.
Pfitzner, A., Stack Pool, Goolgowi.
Rowlands, K., "Wilverlyn," New Grenfell Road, Forbes.
Rowlands, E. J., "Green Hills," New Grenfell road, Forbes.
Reynolds, S. R. & Bellamy, "Burrawong," Cumnock.
Stephens, E. F., Farm 1079, Murrami.
Scott, W. J., Lansdowne, Bathurst Road.
Trotman, R. E., "Norton," New Grenfell road, Forbes.
Tremain, W., Obley-road, Yeoval
Thompson, J. & Patton, T., "Baroona," West Wyalong.
Wells, W., Goolgowi.
Windus, L. R., Cudal.
Watts. W. C., Gumble, via Manildra.
Wallace Bros., "Dungavan," Temora.

Bencubbin.—continued.

Young, J.. "Southern Wood," Cumnock.
Young, C R.. "Hillcrest," Ulamambri.
Trevaskis, C. L., and Turner, W. T., "Yarran Lea," Ariah Park.
Trevaskis, E., "Yarran Lea," Ariah Park.
Mann, R. S., "Ocean View," Lake Cargelligo.
Rumble, F. D., "Weventure," Muttama.
Gorham, A. A., "Oak Hill," Boorowa.
Armstrong, H., "Allendale," Boorowa.
Armstrong, K., "Heathfield," Boorowa.
Holden, T., Box 210, Griffith.
Heath, E. A., "Acres," via Yenda.
Doyle, J. O., Yenda.
Goldberg, S., Griffith.
Dennis, S. A., c.o. D. L. Cox, Private Bag, Narrandera-road, Wagga.
Westman, S., Clifton Park, Euberta.
Lucas, S., Springfield, Coolamon.
Bradley, P., Dullah, via Coolamon.
Bredin, R. W., Alderbury, Coolamon.
Higman Bros., Rannock, via Coolamon.
Edwards, H. T., Pullitop.
Woods, W. J., Burrandana.
Jenkins, C. D., Kyalla, Burrandana.
Johnston, G. J., Fairview, Burrandana.
Davidson, S. P., Strathdene, Mangoplah.
Taber, C. J., Glenburn, R.M.B. 185, Collingullie.
Cox Bros., Granville, Collingullie.
Kanaley, S. J., Hazeldene, Marinna.
Mitchell and O'Halloran, R.M.B. 340, Albury-road, Wagga.
Harper, estate A., Waratah, Albury-road, Wagga.
Croudace, K. P. B., Waverley, Mangoplah.
Hart, C. S., Temora-road, Old Junee.
Carlon, Ron., Arcaroola, Old Junee.
Smith Bros., Brooklyn, Ladysmith.
Scott, H. U., Buccleuch, Coreinbob.
Rodham, J. H., Uranquinty.
Poulter, E., Kilburnie, The Rock.
Lockwood and Baker, Compton, Gregadoo.
Leonard Bros., "Sommerfield," Birriwa.
Erwin, Mr., "Fenella," Birriwa.
Bur'e, Mr., "Durrie," Birriwa.
Deutcher, Mr., "Eden," Birriwa.
Rains, S. V., "Mongarlow," Birriwa.
Gudgeon, Mr., Gulgong.
Gleeson, Mr., Stony Creek, Cooyal.
Ryan, J. M. and J. J., "Clandora," Berrigan.
Thornton and Sons, Spring Farm, Berrigan.
Moore, C., Finley-road, Deniliquin.
McRae, W., Urangeline East.
Carnegie, D., Holbrook.
Altmier, J., Splitter's Creek (Albury).
Scheetz, I. P., Brocklesby.
Schilg, S. and K., Burrumbuttock.
Paech, L. R., Walla.
Moll, G., Gerogery.
Mazzocchi, J. J., Culcairn.
Montague, J. A., The Rock.
Howard, E. C., Yerong Creek.
Barker, E. J. H., Walbundrie.
Hutson, F. J., Walbundrie.
Scott, W. B., Henty.
Scott, W. J., Henty.
Obst, K., Lockhart.
Leddin, D., Urangeline East.
Leischke, I. J., Walla.
Leischke, T. A., Walla.

Bencubbin.—continued.

Hutchings, G. F., Yerong Creek.
Smith, G., Cookardinia.
Schulz, F. G., Henty.
Newton, D., Urangeline East.
Inwood, A. N., "Toulon," Glanmire, via Bathurst.

Bobin.—

Reid, G. Moorwartha.
Scott, W. B., Henty.
Brown W., Daysdale.
Henderson, J. H., The Rock.
Leischke, J S., Walla.
Leischke, I. J., Walla.
Bredin, R. W., Alderbury, Coolamon.
Seymour Bros., Rocky Hill, Marrar.
Boothey, O. H., Coromondel, Temora-road, Coolamon.
Boothey, L. H., St. Alban's, Temora-road, Coolamon.
Turner, W. A., Iona, Old Junee.

Bordan.—

Stewart, J. L., "Meroola," Ardlethan.
Stewart, J. M., "Bygoo," Ardlethan.
Weir Bros., Holmwood, via Cowra.
Payten, J., "Kaloola," Goolagong.
Barber, A. E., "Embrose," Baldry.
Balcombe, H. J., "Pekoona," Toogong.
Cullen Bros., Harden.
Davis, O. P., "The Pines," Gumble.
Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
Killick, K. P., "Illawa," Galong.
Kelly, W. G., "The Oaks," Barmedman.
Lodge, C. E., "Ellerslie," New Grenfell road, Forbes.
Love, R. B., "Yarrabundle," Trundle.
McLaren, R. W., "Glenmore," Barmedman.
Malcolm, A. D., Farm 1039, Colando, via Leeton.
McCormack, A., Farm 159, Stoney Point, via Leeton
Quodling, W. J., "Garangery," Corbie Hill road, via Leeton.
Russell, L. J., Morongla.
Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
Watts, E. R., Bald Hills, Manildra.
Holden, T., Box 210, Griffith.
Delaney, F. C., 39 Banna-avenue, Griffith.
White, H., c.o. A. Rowlands, "Hilton," Mandurama.
Tipping, A., Bowden Farm, Tooyal North.
Maloney, estate P. J., Kincora, Coolamon.
Menzies, P., Dunrobin, Coolamon.
Edwards, H. T., Pullitop.
Beazley, L., Glenorchy, Albury-road.
Carlon, Ron, Arcaroola, Old Junee.
Flanagan, T. M., Yallambee, Ladysmith.
Caldwell, J. D., and Sons, Berrigan.
Whiley and Purser, Millthorpe.
McPhillamy Bros., P.O. Box 30, Oberon.
Montague, J. A., The Rock.
Paech, E. J., Henty.
Leischke, J. S., Walla.
Hutchings, G. F., Yerong Creek.
Gardiner, N., King's Plains, via Blayney.

Bordan.—continued.
Gardiner, A. K., King's Plains, via Blayney.
Gordon, G., Moorilda, via Newbridge.
Edwards, G., "Terlea," Box 15, Newbridge.
Toohey, A. and Masters, A., Barry, via Blayney.
Blazley, R., Carcoar.
Blazley, H., Carcoar.
Burns, W., "Goongirwarrie," Carcoar.
Stonestreet, E. E., Greghamstown, via Blayney.
Marriott, W., Box 30, Millthorpe.
Pearce, G. W., "Springfield," Orange.

Bungulla.—
Burke, Mr., "Durrie," Birriwa.
Trevaskis, E., "Yarran Lea," Ariah Park.

Charter.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
Jenkins, C. D., Kyalla, Burrandana.
Rodham, J. H., Uranquinty.
Read, G., Wyrilla, Uranquinty.
Reynoldson, A., "Carramar," Berrigan.
Moore, R. A. and J. M., Cullivel.

Dundee.—
Aitken, W. H., "Afton," Beckom.
Carroll, F. J., "Killara," Ardlethan.
Danaher, T. W., "Mine View," Ardlethan.
Howe, K., Bungowannah.
Ross, C. E., Brocklesby.
Ross, S. W., & Shipard, G. B., Brocklesby.
Humphries, K., Bungowannah.
Barrett, G. & C., Woodridge, Manildra.
Langfield, R., Morongla.
Quinn, W. A., "Inglewood," Young.
Wallace Bros., Dungavan, Temora.
Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
Bradley, P., Dullah, via Coolamon.
Menzies, P., Dunrobin, Coolamon.
Edwards, H. T., Pullitop.
Main, G., jnr., Ardrossan, Illabo.
Mitchell and O'Halloran, R.M.B. 340, Albury-road, Wagga.
Harper, estate A., Waratah, Albury-road, Wagga.
Macrae, A. J., Lucerne Vale, Mangoplah.
Croudace, K. P. B., Waverley, Mangoplah.
Rodham, J. H., Uranquinty.
Warren, W., Ellwood, Illabo.
Shelly, A. W., Howlong.
James, A. C., Yerong Creek.
Newton, D., Urangeline East.
Sellwood, R. C., Urangeline East.
Clancy, J., Urangeline East.
Pearce, R., Corowa.
Reid, G. D., Moorwartha.
Scheetz, I. P., Brocklesby.
Schilg, S. and K., Burrumbuttock.
Schilg, O., Burrumbuttock.
Montague, J. A., The Rock.
Murphy, A. G., Henty.
Munro, D., Daysdale.
Patey, R., Daysdale.

Echo.—
Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Eureka.—
Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
Cartwright, F. C., "Boundary Villa," Sebastopol.
Renshaw, C., "Boogadah," Binnaway.
Stapleton, H., "Gundamain," Cudal.
Wallace Bros., Dungavan, Temora.
Murphey, W. T., Yerong Creek.
Proctor, Mrs. F. J., Bungowannah.
Smith, G., Cookardinia.
Moore, R. A and J. M., Cullivel.
Lucas, S., Springfield, Coolamon.
Tresco Farming Co., Box 624, Griffith.
Woodside, J., Boree Plains, Griffith.

Eureka 2.—
Ballantyne, G. G., "Clifton," Ariah Park.
Ridley, J., Hilltop, Collingullie.

Fedweb.—
Hodges, C. H. & Sons, Baldry.
Moore, R. A. and J. M., Cullivel.
Coon, J. A., "Homeleigh," Coonabarabran.

Ford.—
Stewart, J. L., "Meroola," Ardlethan.
Carroll, F. J., "Killara," Ardlethan.
Capps, E. A., & Sons, Wynfield, Cowra.
Walker, F. W., "Glenelg," Canowindra.
Keir, J. A., "Braeside," Grenfell.
Ross, C. E., Brocklesby.
Frohling, W., Moorwartha.
Hutson, F. O., Walbundrie.
Balcombe, H. J., "Pekoona," Toogong.
Balcombe, R. A. H., "Sussex," Toogong.
Bendle, W. J., "Bankside," Monteagle.
Coddington, H. G., "Invergowrie," Young.
Davis, O. P., "The Pines," Gumble.
Gray, F. A., "Sterling Chase," Cudal.
Glenn, A., Farm 1428, Murrami.
Hart, J. K., Lagoona, Galong.
Hall Bros., "Ellerslie," Wallendbeen.
Hodges, C. H., Baldry.
Johnson, T., Farm 348, Wamoon.
Johnson, R. R., "Umarla," Forbes-road, Grenfell.
King, F. R., Farm 388, Wamoon.
Killick, K. P., Illawa, Galong.
Langfield, R., Morongla.
Martens, C. F., "Quamby," Grenfell-road, Young.
Murray, R. S., "Maryville," Cudal.
Marchington, S., Box 618KK, Griffith.
Rickets, C. T., "Peak View," Young.
Stapleton, H., "Gundamain," Cudal.
Salmon, M. T., Pucawan.
Tremain, W., Obley-street, Yeoval.
Thornberry, L. C., "Waverty," Private Bag, Cudal.

Ford.—continued.
- Watson, Est. E. U., South Greenbank, Thuddungra, via Young.
- Howard, G., Springdale.
- Gordon, T., "Godolphin," East Guyong.
- Bennett, J. W., "Taringa," Box 15, Blayney (Vittoria Mail Service, via Blayney).
- Saundry, L. W., Millthorpe.
- Hutson, F. J., Walbundrie.
- Carnegie, D., Holbrook.
- Pearce, R., Corowa.
- Moll, G., Gerogery.
- Schilg, O., Burrumbuttock.
- Warren, R. H., The Rock.
- Webb, J., Gerogery.
- Burke, Mr., "Durrie," Birriwa.
- Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
- Johnston, C. J., Fairview, Burrandana.
- Davidson, S. P., Strathdene, Mangoplah.
- Brunskill, A., Allonby, Wagga.
- Harper, estate A., Waratah, Albury-road, Wagga.
- Croudace, K. P. B., Waverley, Mangoplah.
- Cotterell, Mr., Ladysmith.
- Warren, W., Ellwood, Illabo.
- Cox Bros., Granville, Collingullie.
- White, H., c.o. A. Rowlands, "Hilton," Mandurama.
- Freudenstein, R. D. and B., "The Ranch," Greenthorpe.
- Trevaskis, C. L. and Turner, W. T., "Yarran Lea," Ariah Park.

Gabo.—
- McColl & Sons, H. O., "Strathmore," Koorawatha.
- Johnson, R. R., "Umarla," Forbes-road, Grenfell.
- Kendall, Est. B. W. J., Lulworth, Murrumburrah.
- Rigby, Mrs. S. B., "Guyroi," Pallamallawa.
- Rickets, C. T., Peak View, Young.
- Rathbone, R., Box 101, Griffith.
- Tipping, A., Bowden Farm, Tooyal North.
- Furnell, A. A., Aldersyde, R.M.B. 204, Coolamon.
- Lucas, S., Springfield, Coolamon.
- Higman Bros., Rannock, via Coolamon.
- Brunskill, A., Allonby, Wagga.
- Bartlett, G., Avondale, Coolamon.
- Schultz, F. G., Henty.

Ghurka.—
- Stewart, J. M., "Bygoo," Ardlethan.
- Baker, M., Temora.
- Wallace Bros., Dungavan, Temora.
- Mohr, H. Q., Glengarrie, Mangoplah.
- Holden, T., Box 210, Griffith.
- Delaney, F. C., 39 Banna-avenue, Griffith.
- Barbour, S., Box 15, Griffith.

Gular.—
- Stewart, J. M., "Bygoo," Ardlethan.
- Hutson, F. O., Walbundrie.
- Barker, E. J., Walbundrie.
- Hutson, F. J., Walbundrie.
- Burke, Mr., "Durrie," Birriwa.

Javelen.—
- McLaren, R. W., "Glenmore," Barmedman.

Koala.—
- Cummins, Est. P., Broula, Cowra.
- Payten, J., "Kaloola," Goolagong.
- McEvoy, J., "Levuka," Bugaldie.
- Cassells, W. T., "Omagh," Frogmore.
- Carey, J. & Sons, Numalla, via Trundle.
- Forsythe, J. G., Gwandolan, Cootamundra.
- Hall Bros., "Ellerslie," Wallendbeen.
- Hodges, C. H. & Sons, Baldry.
- Hurle, A. M., Grogan.
- Killick, K. P., "Illawa," Galong.
- Johnson, R. R., "Umarla," Forbes-road, Grenfell.
- McClintock, M., Mannamite, Cootamundra.
- Russell, L. J., Morongla.
- Rowlands, C. J., "Green Hills," New Grenfell road, Forbes.
- Rowlands, K., "Wilverlyn," New Grenfell road, Forbes.
- Trotman, R. E., "Norton," New Grenfell road, Forbes.
- Scott, W. B., Henty.
- Campbell, C. C., Henty.
- Higman Bros., Rannock, via Coolamon.
- Menzies, P., Dunrobin, Coolamon.
- Seymour Bros., Rocky Hill, Marrar.
- Bartlett, G., Avondale, Coolamon.
- Poulter, E., Kilburnie, The Rock.

Kondut.—
- McLaren, R. W., "Glenmore," Barmedman.

Nabawa.—
- O'Donoghue, J., Yerong Creek.

Pusa 4.—
- Stewart, J. L., "Meroola," Ardlethan.
- Aitken, W. H., "Afton," Beckom.

Ranee.—
- Salmon, M. T., Pucawan.
- Caldwell, J. D. and Sons, Berrigan.

Ranee 4H.—
- Pearce, R., Corowa.

Rapier.—
- Aitken, W. H., "Afton," Beckom.
- Stewart, J. L., "Meroola," Ardlethan.
- Stewart, J. M., "Bygoo," Ardlethan.
- Weir Bros., Holmwood, via Cowra.
- McColl, H. O., & Sons, "Strathmore," Koorawatha.
- Marshall, A. O. & B. C., "Pinelodge," Canowindra.
- Amos, A. J., "Rockdale," Cowra.
- Herbert, T. J., "Carnarvon," Road Mail Bag 519, Leeton.
- Hodges, C. H. & Sons, Baldry.
- Jones, E. G., "Renee Valley," West Wyalong.
- Langfield, R., Morongla.

Rapier.—continued.
Murray, R. S., Maryville, Cudal.
Boothey, O. H., Coromondel, Temora-road, Coolamon.
Scott, W. B., Henty.
Patey, R., Daysdale.
Cullen, W., Gerogery West.
Sargeant, A., Table Top.
Howard, E. C., Yerong Creek.
Schulz, F. G., Henty.
James, A. C., Yerong Creek.

Regalia.—
Way, A. J., Berrigan.
Nesbett, K. W. and D. H., Yarranvale, Deniliquin.
Munro, D., Daysdale.

Totadgin.—
Aitken, W. H., "Afton," Beckom.

Turvey.—
Reid, G., Moorwartha.
Frohling, W., Moorwartha.

Ula.—
Michalk, G. B., "Westwood," Eugowra-road, Parkes.

Waratah.—
Weir Bros., Holmwood, via Cowra.
McColl, H. O., & Sons, "Strathmore," Koorawatha.
Bradford, R. & V., "Cooringle," Nubba, via Wallendbeen.
Corcoran, J. R., "Ballyryan," Boorowa.
Forsythe, J. G., Gwandolan, Cootamundra.
Garry, J., Burramunda, Grenfell-road, Young.
Killick, K. P., Illawa, Galong.
McCarthy Bros., East Grove, McMahon's Reef, Galong.
Salmon, M. T., Pucawan.
Ward, R., Gilgal, Frampton.
Barker, E. J. H., Walbundrie.
Munro, C., Walla.
Paech, L. R., Walla.
Sargeant, A., Table Top.
Cullen, W., Gerogery West.
Webb, J., Gerogery.
Montague, J. A., The Rock.
Clancy, J., Urangeline East.
Carnegie, D., Holbrook.
Leischke, J. S., Walla.
Murphy, W. T., Yerong Creek.
Palmer, B., Wandana, Ladysmith.
Lucas, S., Springfield, Coolamon.
Johnston, G. J., Fairview, Burrandana.
Davidson, S. P., Strathdene, Mangoplah.
Cox Bros., Granville, Collingullie.
Beazley, L., Glenorchy, Alburyroad.
Flanagan, T. M., Yallambee, Ladysmith.
Smith Bros., Brooklyn, Ladysmith.
Poulter, E., Kilburnie, The Rock.
Walker, A., c.o. J. H. Kendall, Miarb, The Rock.
Kelly, D., Hawthorne, The Rock.
Armstrong, K., "Heathfield," Boorowa.

Warigo.—
Goldberg, Dr. S., Griffith.

Yalta.—
Rigby, Mrs. S. B., "Guyroi," Pallamallawa.

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Howard, G., Springdale.
McClintock, M., Mannamite, Cootamundra.
Starr, W. C., Box 6, Guyra.
Burns, W., Goongirwarrie, Carcoar.
Gardiner, N., King's Plains, via Blayney.
McLellan, D. J., Walla.
Webb, J., Gerogery.
Dickson, A. S., "Yurunga," Oberon.
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Quinn, W. A., Inglewood, Young.
Salmon, M. T., Pucawan.
Wallace Bros., Dungavan, Temora.
Carter, J. S., Gerelgambeth, Illabo.
Humphries, K., Bungowannah.
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Carlon, Ron, Arcaroola, Old Junee.

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Marshall, A. O. & B. C., "Pinelodge," Canowindra.

Fulghum.—
Crick, T. F., Binginbar, Gollan.

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Whiley and Purser, Millthorpe.
Simpson, F. S., Milton, Guyra.

Lampton.—
Thompson, R., Melrose Farm, Glen Innes.
Piper, J. A., "The Glen," Llangothlin.
King, H. S., Glenroy, Llangothlin.

Barley.

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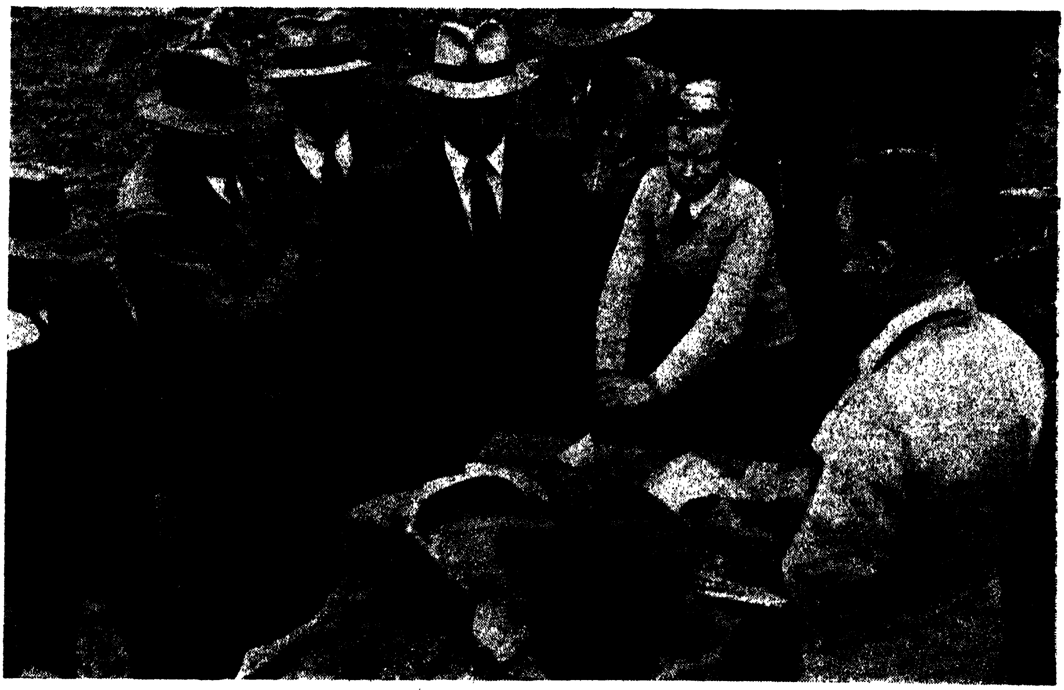
The South Coast and Monaro

Field Demonstrations are a Feature of Agricultural Bureau Conferences.
Conference delegates intent upon what Messrs. D. Walker (Stock Inspector) and J. Healey (District Veterinary Officer) have to say on sheep diseases. This demonstration was on Mr. H. Flanagan's "Woodlands" property, Berridale.



Seeing is Believing: Post-mortem on a Sheep.
Stock Inspector opens up a sheep to demonstrate to delegates where to look for and how to identify internal parasites. Comment on control of these parasites was supplied by the District Veterinary Officer.

Agricultural Bureau Conference.

Let Me Show You How to Reduce "Fluke" Losses.
Stock Inspector demonstrates how to "bluestone" a small watercourse to kill fluke carrying snails. All recommended methods of dealing with fluke were fully discussed and demonstrated.

Catch Your Snail First . . . And Then Identify It.
Delegates searching for fluke-carrying snails in a creek. They were then told how the fluke-carrying snail differed from harmless species.

PLANT DISEASES

EAR, COB AND GRAIN ROTS OF MAIZE.

F. C. BUTLER, B.Sc.Agr., Assistant Plant Pathologist.

MAIZE is subject to a number of diseases variously referred to as ear, cob and grain rots, which annually result in substantial yield losses. Frequently, too, the use of grain from diseased cobs for seed purposes, leads to the development of seedling blights, root rots and stalk rots in the growing crop.

In this article only the ear, cob and grain rot conditions are described. The descriptions provided should be of value, not only in assisting diagnosis of these diseases in the field, but also in providing a guide to the selection of disease-free grain for seed purposes.

The Fusarium Rots.

The most important ear rots of maize in New South Wales are caused by the *Fusarium* moulds. Three quite distinct species of Fusaria are involved, and the identity of the causal organism in each case can be determined by:—

(1) A microscopical examination of the fungal mycelium;

(2) The type of rotting produced, and

(3) The colour of the rotted tissue.

Fig. 1—Maize Ear Showing Localised Rotting Due to *Gibberella moniliformis*. A Similar Condition is Caused by *Gibberella fujikuroi* var. *subglutinans*.

This type of infection commonly follows insect injury.

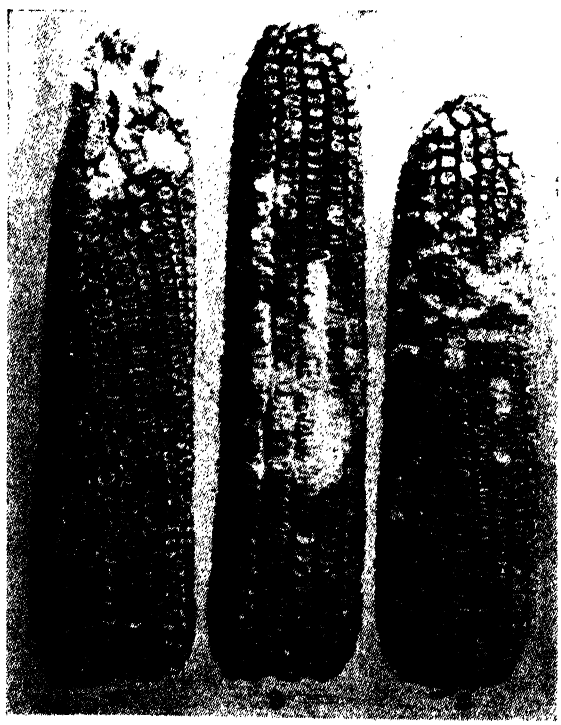


Fig. 2—Ear A shows Typical Tip Infection with Fusarium Rot of the *Gibberella moniliformis* and *Gibberella fujikuroi* var. *subglutinans* type.

Ear B shows the Localised Rot Condition Characteristic of Infection by these Organisms: whilst Ear C shows a Typical Rot Condition of Individual Grains.

[*After Koehler and Holbert.*

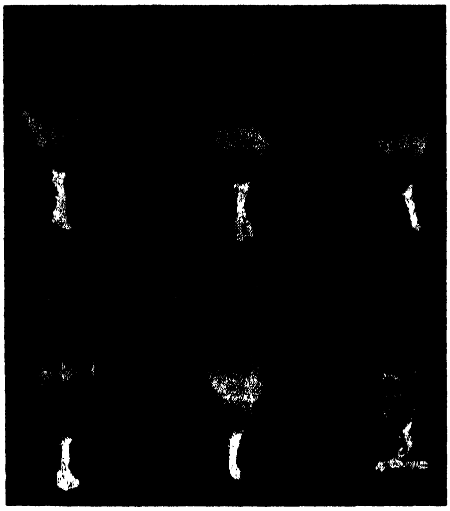


Fig. 3—Maize Grains Showing White Streaking of the Seed-coats and Long Stringy Attachments to the Tips.
Such a condition may be caused by *Gibberella moniliformis* and grain of this type should be rejected for seed purposes.

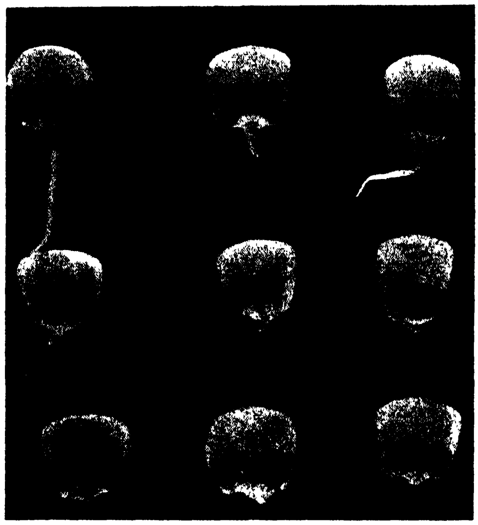


Fig. 5—Germinating Maize Grains Showing Pronounced Reddish-purple Discolouration Due to Heavy Internal Infection with *Gibberella fujikuroi* **var.** *subglutinans.*

Fig. 4—Maize Ear showing Characteristic Type of Rotting Produced by *Gibberella saubinetii.*

Fig. 6—Rot Condition caused by Infection with *Gibberella saubinetii.*
Note rotting and binding together of hust tissues, which are cemented to the underlying rotted grains.

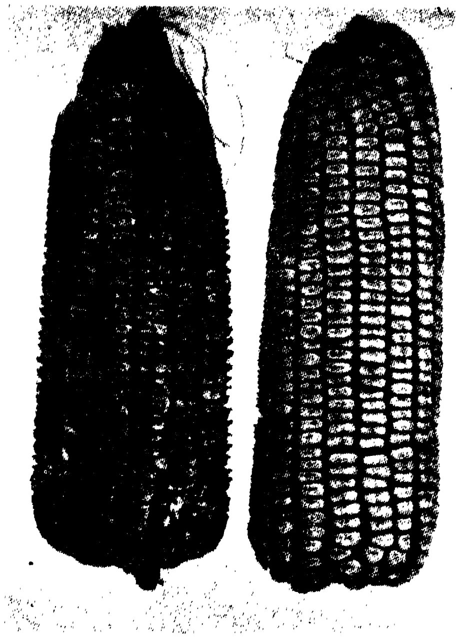


Fig. 7—An Ear of Maize Rotted by *Diplodia*, and a Normal Ear.

[*After Eddins*.

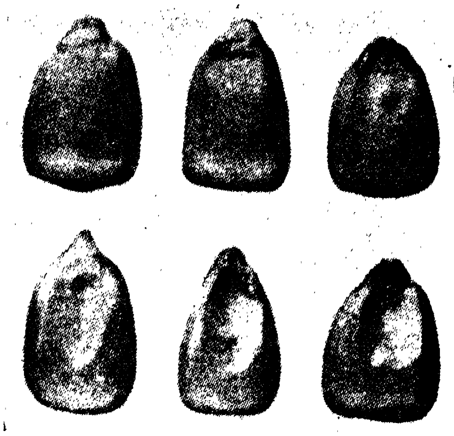


Fig. 9—Grains Infected with *Basisporium*.
The small black spores of the fungus can be seen at the tip end of each of the four grains on the right.

[*After Koehler and Holbert*.

Fig. 8—Diplodia Infected Ear showing Numerous, Small, Black Spore Cases of the Fungus on the Inner Husks.

[*After Korhler and Holbert*.

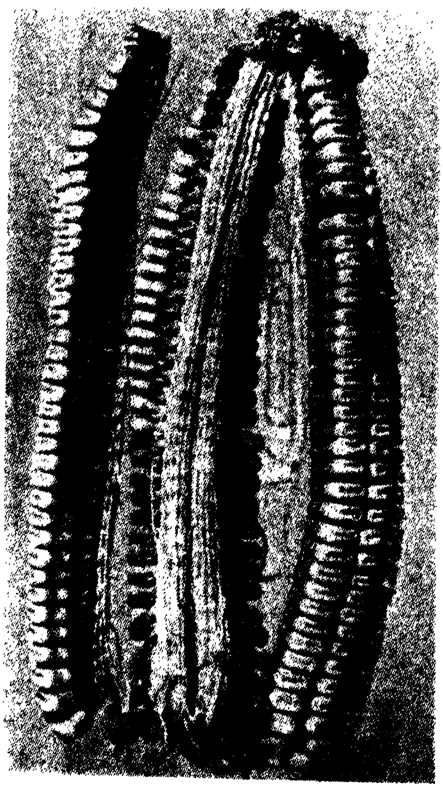


Fig. 10—Basisporium Cob Rot, showing Longitudinal Splitting of the Cob.

[*After Koehler and Holbert*.

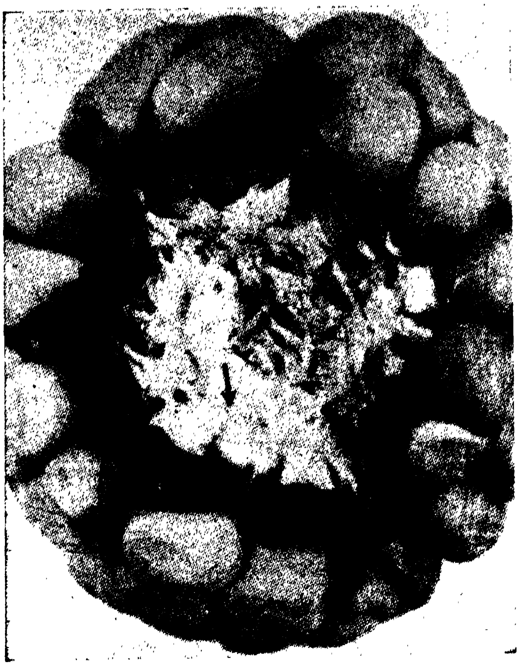


Fig. 11—Basisporium Cob Rot showing Black Ring of Spores around the Shank Attachment.

[After Koehler and Holbert.

Two of these organisms, more correctly known as *Gibberella moniliformis* and *Gibberella fujikuroi* var. *subglutinans*, cause a very similar grain rot condition, and a definite identification of the causal organism depends on a microscopical examination. Both are commonly responsible for the rotting of either individual grains, or of localised areas on the cob. (Figs. 1 and 2). Only occasionally is a general rotting of the ear tissues involved. Another rot condition characteristic of infection by these organisms occurs at the tip of the cob, and frequently follows corn ear worm or other insect injury (Fig. 2).

The mycelium is well developed and produces a white or pinkish, "cobwebby" growth over and between the rotted grains. Individual rotted grains usually show a faint reddish or purplish discolouration at first, but later become light brown.

A streaking and bleaching effect, extending from the tip towards the dent end of the grain is sometimes indicative of internal *Gibberella moniliformis* infection (Fig. 3), but such a condition may also result from infection by other fungi, such as *Cephalosporium acremonium*. Severe internal infection, particularly with *Gibberella fujikuroi* var. *subglutinans*, is frequently characterised by the development of a pronounced reddish-purple discolouration in germinating grains (Fig. 5).

Whereas the abovementioned Fusaria cause a more or less localised rot condition, the third organism, *Gibberella saubinetii*, is usually responsible for an extensive, overall rot condition extending for some distance down the cob from the tip end (Fig. 4). Occasionally a butt-end rot occurs, however, and in cases of severe infection the entire ear may be rotted.

The rotted grains and cob tissues show a pronounced reddish or pinkish discolouration at first, but with age, the rotted grains assume a dark-brownish colour. A well developed, pinkish-white mycelial growth is usually found on the surface of, and between, the rows of rotted grains. Frequently the husk tissues are bound together and cemented to the underlying grains by this heavy mycelial development (Fig. 6). A shredding of the husk at the tip end is also common (Fig. 4). On occasions the

Fig. 12—Multiple Ear Development, caused by Black Bundle Disease.

This condition is frequently an indication of infection with *Cephalosporium*.

[After Koehler and Holbert.

small, black, rounded spore cases of the fungus can be seen on the outer husk tissues.

Dry Rot.

Dry rot is caused by the parasitic fungus, *Diplodia zeae*. This organism is a creamy white mould which causes progressive general rotting (Fig. 7) of the ear from either

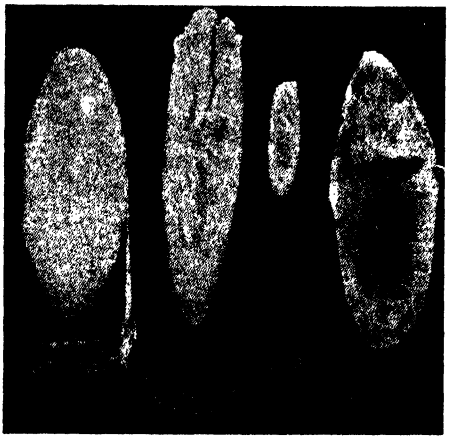


Fig. 13—A Healthy Stalk (left) and Three Others infected with Black Bundle Disease.
The vascular bundles (which conduct water and food through the plant) are normally colourless. The three stalks on the right show a darkening of the vascular bundles due to *Cephalosporium* infection.
[*After Koehler and Holbert.*

the tip or butt-end of the cob. Infected cobs usually show a brown discolouration whilst individual rotted grains are typically greyish-brown or dull brown, and are loose on the cob. A reddish-brown colour, associated with darker areas, develops with age and on such grains the small, scattered, black spore cases of the fungus may develop.

Fig. 14—Germinated Grains Infected with *Cephalosporium acremonium* (A) and *Gibberella moniliformis* (B).
Note streak condition and white, bleached appearance in (A).
[*After Koehler and Holbert.*

The husks, which are frequently dotted with the small, black spore cases of the fungus (Fig. 8) may be cemented together and to the underlying rotted grains by a whitish grey mycelium. On removal of the husk, the cob shows a general white mouldy appearance. The fungus also occurs as a dense, white weft between the grains on the cob.

Seed internally infected with *Diplodia* usually shows a dull-brown to bluish-black colour when germinating, and a brown rot condition of the developing roots and shoot frequently occurs.

Fig. 15—*Aspergillus niger* on Germinating Maize Grains
The black growth around the germ is composed of numerous spore heads of the fungus. *Aspergillus flavus* produces a similar growth but the spore heads are yellow in colour.
[*After Koehler and Holbert.*

Basisporium Cob Rot.

This cob rot is caused by the parasitic fungus known as *Basisporium gallarum*.

The fungus grows on the cob, producing a white, loose mycelial growth in the cob tissues and often in the furrows between the rows of grain. Small, black spores which can be seen with the naked eye are produced in abundance at the butt of the ear and at the base of individual grains, giving a black, speckled appearance (Fig. 9). When infection is general, the cob tissue surrounding the point of attachment to the shank shows a characteristically rotted or shredded condition. Badly infected cobs

break easily either crosswise or lengthwise (Fig. 10), and the grains on such cobs are invariably loosely attached.

Infection of the ear may occur through either the tip or the shank. When broken crosswise, a ring of small, black spores can frequently be seen around the shank attachment of the ear (Fig. 11) and even in the core of shank-infected cobs. Infected ears are also light and chaffy, and individual grains have a shrunken appearance. Sometimes a superficial examination of a diseased cob reveals little evidence of rot, but when the grains are shelled they are found to be discoloured and rotted at the germ.

Black Bundle Disease.

This disease is caused by the parasitic fungus, *Cephalosporium acremonium*. Affected plants are characterised by the

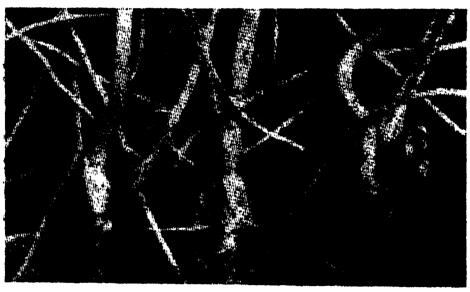


Fig. 1[illegible]—Fruiting Bodies of *Rhizopus* on Germinating Maize Grains.
[*After Koehler and Holbert.*

development of a reddish or purplish colour at the dough stage. Typically such plants produce barren stalks, or stalks with misshapen ears. There is also a tendency to multiple ear development (Fig. 12), and the production of a nubbin ear condition.

When the stalks of affected plants are cut across, the vascular bundles are seen to be blackened, particularly in the vicinity of the nodes (Fig. 13).

Cephalosporium forms a delicate, white mycelium, which, however, seldom develops externally over the ear. Consequently, ears, though diseased, may show no outward signs of infection. Infected seed, however, is usually characterised by a white, bleached appearance at the germ end of the grain and white streaks frequently extend back over the seed coat from the infected tip (Fig. 14).

Penicillium Cob and Grain Rot.

Species of *Penicillium* seldom cause extensive rotting in normal uninjured maize when the cobs and grain are in an actively growing condition. However, if the cobs are left too long on the stalk under moist weather conditions, or if the ears are dried under conditions of poor ventilation, infection may occur.

Tip end infection is common with *Penicillium*. A dull, blue mouldy growth develops, and the ear is covered with dusty masses of spores which come off easily when the ear is shaken.

Aspergillus Ear Rot.

Aspergillus niger causes a black mould and frequently follows corn ear-worm attack in moist seasons. Severely infected ears may have the entire surface under the husk covered with a black, sooty powder, whilst

Fig. 17—Two Black Moulds, *Basisporium gallarum* (A, B) and *Alternaria* sp. (C) on Maize Grains.
Basisporium infected grain has a granular appearance, whilst *Alternaria* is characterised by a downy growth over the grain.
[*After Koehler and Holbert.*

the individual grains are undersized, shrivelled and blackened. Infection of the grain usually occurs at the tip end. (Fig. 15).

Other species of *Aspergillus* also cause a mould condition of maize grain. Apart from *Aspergillus niger,* probably the most important of these is *Aspergillus flavus*, which causes a yellow mould. Diseased parts of a severely moulded ear are covered with a dusty yellow mould and the affected grains are small, shrivelled, and brown in colour.

Storage Rots and Moulds.

Apart from the cob and ear rots which they cause, species of *Penicillium* and *Aspergillus* together with a number of other moulds often occur on germinating grain, on stored maize grain and even on grain still on the cob in the field. In the latter

instance, mould attack usually follows some form of grain injury by birds or insects. Organisms involved, apart from *Penicillium* and *Aspergillus* include species of *Rhizopus* (Fig. 16), *Alternaria* (Fig. 17), *Acrostalagmus, Trichoderma* and *Cephalothecium*. In addition, species of *Mucor, Torula, Tricothecium, Monilia, Hormodendrum* and *Sporotrichum,* occurring in the nature of non-rotting saprophytes, have been recorded on maize grains in this State.

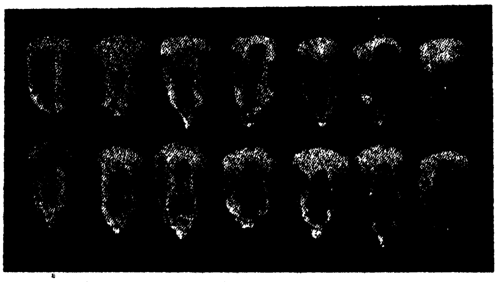


Fig. 18—"Blue Eye" of Maize Grain caused by a Growth of *Penicilium* over the Germ and Beneath the Seed Coat.

[*After Koehler.*

These fungi usually occur at the germ end of the grain, variously resulting in the development of white, pink, yellow, brown, green, blue or black mould-like growths. The effect of the moulds is to impair seed germination, and, if conditions are favourable for their development they may cause considerable injury, or even result in the death of the young developing shoots or roots.

These organisms, for the most part, are externally seed-borne, although the condition known as "Blue Eye" (Fig. 18) is caused by a *Penicillium* growth under the seed coat in the region of the germ. Being restricted to the outside of the seed, the development of these organisms is checked by the use of seed dust treatments. The best results have been obtained with organic mercury dusts such as "Ceresan," "Agrosan" and "Semesan."

Control Measures for Ear, Cob and Grain Rots.

1. *Selection of disease-free seed.*—This should be done, first in the field and secondly in the barn, and, from the disease control viewpoint, attention should be paid to the following points:—

(a) Field Selection:

(i) Avoid ears from diseased, lodged or broken stalks or from stalks with rotted or broken shanks.

(ii) Select ears early—delay may lead to the development of a mould condition in the field.

(iii) The whole ear should be free of moulds, bird or insect injury, and discolourations of any kind.

(iv) Ears with shredded butts and husks should be avoided.

(b) Barn Selection:

Having selected the ears in the field, they should be dried quickly in a dry, warm, well-ventilated place. Then—

(i) Grain showing the presence of fungal spores, a streak (Fig. 19) condition or black, brownish or whitish discolourations should be discarded.

(ii) Any grain showing a broken or cracked seed coat as occurs in "silk cut" affected seed (Fig. 20) should not be sown. Such injury facilitates the entrance of moulds and may result in poor germination and the development of seedling blights.

Fig. 19—One Sound and Three Infected Grains. White streaks, as shown, are a sign of fungal infection and grain showing such a condition should be discarded for seed purposes.

[*After Koehler and Holbert.*

(iii) Grain with stringy tip attachments (Fig. 3) should also be discarded.

2. *Control by Cultural Practices.*—

(i) Maize should not be sown in infected land where old diseased crop residues from the previous season are present.

(ii) The control of these diseases essentially depends on general field sanitation, involving the destruction, by burning, of old diseased stalks and trash.

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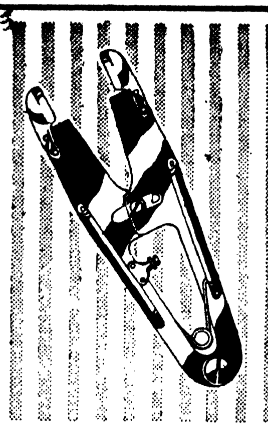

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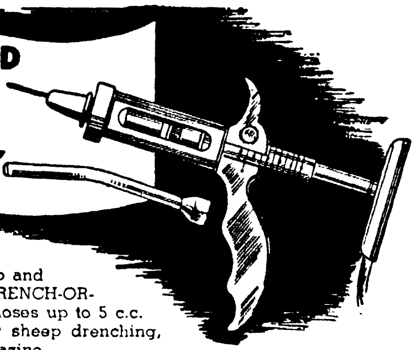

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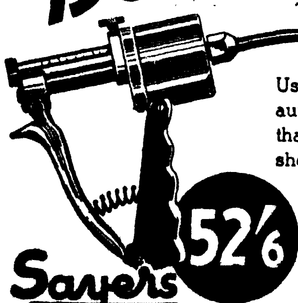

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Fig. 20—Silk Cut of Maize.
[*After Koehler.*

(iii) Where possible, a form of crop rotation in which maize is not grown continuously on the same land, should be adopted.

(iv) In most seasons, late sowings are of value in reducing the degree of seedling blight infection.

3. *Control by Seed Treatment.*—Because the causal organisms of the ear, cob and grain rots of maize overwinter on old diseased crop residues in the soil and, in some instances, are internally seed-borne, seed treatment does not provide a 100 per cent. efficient control of these diseases. However, it is of value in destroying externally seed-borne spores and in affording protection against the development of moulds on the germinating grain in the soil. For these reasons, dusting of seed maize with an organic mercury compound, such as Ceresan, Agrosan or Semesan, at the rate of 2 oz. per bushel, is recommended as a routine disease control measure. Seed treatment also guards against the possible introduction of new diseases of maize to the farm.

Approved Vegetable Seed—March, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo road, Dubbo.

Fruitgrowing—*continued from page* 136.

a very large part in effective control. For example, the methods recommended for the control of the codling moth include what is known as the "winter clean-up" designed to reduce the number of the over-wintering larvae—the collection and destruction of infected fruit from the ground and off the tree, and the application of bandages to the trunks to trap the pupating larvae.

All such measures play an important part in reducing the moth population in the orchard, but no matter how thoroughly the work is done, it is impossible to find and destroy all grubs. Hence the application of sprays is also necessary, but it should be regarded as merely one phase of the attack on the moth, and not as so frequently happens, as the whole offensive.

Again in the case of the fungous disease powdery mildew, which is particularly prevalent on the Jonathan variety, the cutting out and destruction of as much as possible of the infected terminals and buds during pruning is equally as important in the effective control of this disease as seasonal spraying with sulphur sprays.

(*To be continued.*)

Registration of Apiaries.

Applications for Renewal Due 31st March.

ALL apiary registrations are due for renewal on or before 31st March, and a form for this purpose is being forwarded to all apiarists who have previously registered with the Department. Such renewal is necessary under Section 12 of the Apiaries Act, 1916-1944, which provides for annual registration.

Any beekeeper who has changed his address and not notified the Department should take prompt action to secure a form; some neglect in regard to this necessary notification was evident during the past year.

The Department has been forced to take a serious view of neglect by a number of beekeepers to register or renew registration of their apiaries. This was instanced in a recent case when a beekeeper was charged with not registering his bees, and fined £2 with 8s. court costs and £1 12s. 11d. Departmental expenses.

Fees Increased to Establish Bee Diseases Compensation Scheme.

The scale and range of fees according to the number of hives of bees operated has been increased for the coming year. The purpose of this increase is to institute a Bee Diseases Compensation Scheme under which any New South Wales beekeeper unfortunate enough to have his colonies infected with disease necessitating the destruction of hive material, may apply for compensation.

The new annual scale of fees will be as follows:—

1 to 5 hives of bees 2s.—an increase of 6d.; 6 to 20 hives of bees 4s.—an increase of 1s.; 21 to 50 hives of bees 7s.—an increase of 1s.; over 50 hives of bees 10s.—new range.

Actually the previous range of fees provided that a beekeeper with over twenty hives of bees paid 6s. per annum. The new range, therefore, amounts to an additional 4s. for those operating in the largest way.

A Bee Diseases Compensation Scheme was first recommended by the Commercial Apiarists' Association of New South Wales, the view being held that it would provide necessary relief to a beekeeper who suffered loss as the result of the destruction of his material by order of an Apiary Inspector. Beekeepers knowing that they may be compensated as provided under the scheme will be induced to notify the Department of any outbreaks of disease. This will surely prove an important factor in control

of bee diseases particularly American Foul Brood.

Value of Reliable Beekeeping Statistics.

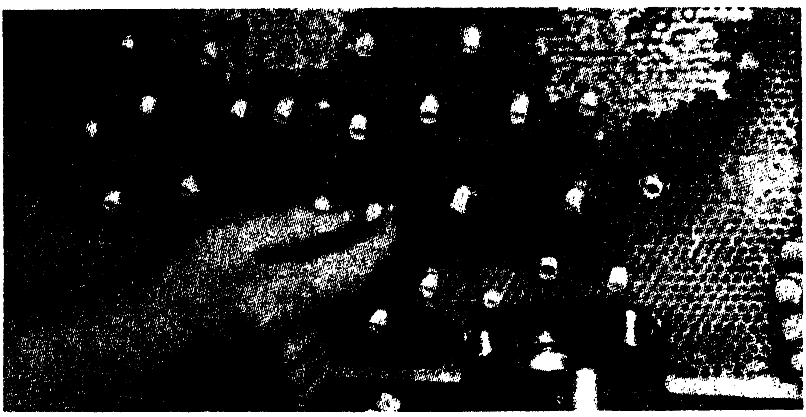
Another important matter which is correlated to annual registration, is the collection of beekeeping statistics. Forms for this purpose are being made available by the Government Statistician, and one of these will be forwarded to every registered beekeeper to complete and return to this Department with the apiary registration form. The information supplied on these statistical forms is regarded as strictly confidential. It is not necessary to sign the forms and they are immediately detached from the registration on receipt in this Department and forwarded to the Government Statistician in bulk.

The compilation of reliable statistics in connection with beekeeping is of very great importance to the industry generally. This is well known to the Department, and also to the Executive of the Apiarists' Association. Such figures are particularly valuable when representations are made to secure some essential service or material supply, and it is desired to quote figures showing the extent of the industry and its progress. Difficulty has been experienced for many years as a result of the lack of reliable statistics, and the full co-operation of beekeepers in overcoming his handicap is most desirable.

A New Zealand Method of Raising Queens.

In Bulletin No. 267, of the New Zealand Department of Agriculture, entitled "Beekeeping in New Zealand," T. S. Winter, Senior Apiary Instructor, quotes a description given by A. T. Myers, Apiary Instructor, of an entirely new method of raising large numbers of queen cells, developed by Mr. C. A. Greig of Nelson, New Zealand. No doubt this method will appeal to those beekeepers who look toward the raising of queen cells under more natural conditions. The method is described as follows:—

"Queen-cell cups are fastened direct on to the surface of a good comb containing an abundance of fresh pollen and honey, by dipping the base of the cells cups into hot wax before pressing them firmly into position. Select a two storey hive, well-filled with a strong force of young worker bees, and remove the queen and all unsealed brood. Draw the balance of the combs in the hive together, leaving a good frame space between two good combs of honey



Fixing Cups to the Surface of the Comb.

[Aft r W.nter.

and pollen in the centre of the top box, and close down the hive. In an hour or so, when the bees have fully realised that they are queenless, the work of transferring larvae into the cell cups should be carried out and the prepared comb placed in the space provided. The usual preparation of the bees for this work by liberal feeding should be carried out. This method is more simple and works closer to nature than other grafting methods so far used in New Zealand."

The accompanying illustrations (from Bulletin 267) will serve as a useful guide for those desiring to try the method. It is evident that the cell cups need to be inserted in the comb between the wires, as the completed queen cells will require to be cut out from the comb before being distributed to nuclei colonies used for increase or queen-raising, etc.

Introduction of Young Queens.

During March and April it is a good plan to replace any two-year-old queens in hives where the bees have given no more than average results. In other hives where some outstanding qualities have been evident, it may be desired to retain the queens to try out for breeding purposes. Even for producing drones, the selected and reserved queens, two or three years old, will give better results than young ones. Young queens do not concern themselves to anything like the same extent in the production of drone brood and, in consequence, it is possible by judicious placing of drone combs with reserved aged queens and giving stimulative feeding, to produce a large percentage of selected drones when required.

The introduction of young well-bred queen bees during the autumn months will, if conditions are in any way favourable, ensure of a good force of young workers for wintering and the making of an early start in progressive brood-rearing during the coming spring. It will prove an advantage too, should the beekeeper decide to work a winter honey flow, as colonies headed by vigorous young queens will stand up to the trying conditions much better than others. When it is possible experienced migratory beekeepers now make a practice of requeening their average stocks every year.

Selecting a Breeding Queen.

In selecting a breeder for queen-raising from reserved outstanding stock, it is recommended that careful consideration be given the following points—

(a) The worker bees should be evenly marked, indicating that the breeding is pure Italian or Carniolan as the case may be.

(b) During manipulation of the hive it should be possible to control the bees with comfort, and they should be steady on the combs.

(c) The queen bee should be well developed; one with a narrow or prominently tapered abdomen is not desirable. Good colour in the queen, although it may not have any particular influence in the breeding, is usually appreciated in Italian strains.

(d) Under normal seasonal conditions, the sealed brood of the colony should be well packed.

Other qualifications such as honey gathering ability and disease-resistance of the bees should have been taken into account prior to this final selection.

Comb of Finished Cells.
[*After Winter.*

Observations on Influence of Change of Flora.

The success which Russian beekeepers have had in training bees to work particular species of flowers, was referred to in a recent issue of the *Gazette*. An interesting observation related to this habit of bees, of following up a particular type of flora, was made by a Mudgee apiarist whose bees were working lucerne—which yielded very well on the flats this season. He had reason for moving a good number of hives from this lucerne country (ground flora) to a forest area where a heavy honey flow from ironbark was on. It was found that the bees so moved were at least a fortnight on the new site before they properly settled down in honey gathering at a comparable

(Continued on page 166.)

INSECT PESTS.

Notes contributed by the Entomological branch

The Indian Meal Moth *(Plodia interpunctella)*.

DURING the past few months reports have been received of the occurence of large numbers of moths in dwellings and stores, and in some instances householders and others have been unduly alarmed, thinking them to be clothes moths.

Although the adults may be observed sheltering in the folds of clothing, by day, or flying in various parts of a building by night, these Indian meal moths do not damage clothes. It is often found that they have developed in quite a small quantity of some stored product, which has been exposed to infestation and left undisturbed for some time in a pantry or other storage place.

The Indian Meal Moth is a cosmopolitan insect which, at times, causes extensive damage to stored foodstuffs. The caterpillar of this moth is one of the most general feeders amongst the insects which attack stored products and may destroy grain and grain products, seeds, nuts, chocolates, candies, dried vegetables, powdered milk, spices, etc., and in addition it is one of the most serious pests of dried and preserved fruits.

The Adult.

The adult is a small moth which may have a wing expanse of up to ⅝ inch. It is of distinctive colouration and readily distinguished from other moths that infest stored products, and from the common clothes moths. The basal portion of the forewings is silvery-white or grey, and the outer portion is a reddish-bronze, with slightly darker markings. The hindwings are silvery-grey. The adults avoid light, and rest during the day, with folded wings, on walls, ceilings, under shelves, etc.

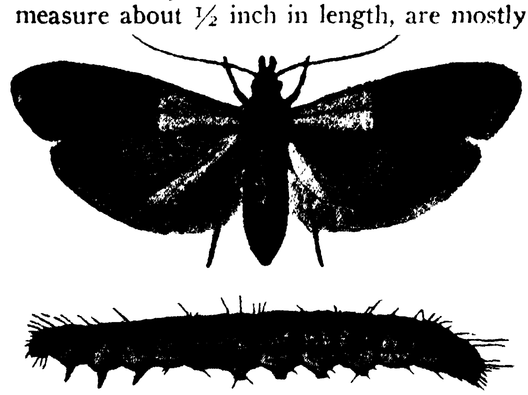
The Egg.

Egg-laying takes place mostly at night, and the small ovate eggs, which measure about one-fiftieth of an inch, are deposited either singly or in clusters, and usually are not firmly attached to the surfaces of foodstuffs or containers upon which they are laid. As many as 300 or more eggs may be laid by an individual female.

The Larvae or Caterpillars.

Upon hatching from the eggs, the minute, almost transparent larvae or caterpillars disperse, and later begin feeding. On dried fruits with a wrinkled exterior, they enter the crevices where they puncture the skin and begin feeding near the surface within, or near a tunnel-like case formed of chewed particles and excreta (frass), webbed together with silk. The caterpillars spin silken threads wherever they crawl, and where the infestation is heavy, the materials may become covered with loosely clinging web, and in addition, become polluted with excrement and cast skins of the larvae and pupae and unfit for human consumption.

When fully-fed, the larvae, which then measure about ½ inch in length, are mostly



Adult and Larva of the Indian Meal Moth.

greyish, but many may be light pinkish-brown or greenish. The head and upper part of the first segment, and the upper portion of the last segment of the larva are pale brown, and the whole body is sparsely covered with long, fine hairs. When ready to enter their pupal or chrysalis stage, the caterpillars crawl to the surface of their food material and there some may spin their cocoons; others may crawl away into nearby cracks in boxes or walls, etc., to spin.

The Pupa or Chrysalis.

The pupa or chrysalis, which measures about ⅜ inch in length, is light brown and glossy, but just before the adult emerges the wing portions become almost black.

The Life-Cycle.

The life-cycle from egg to adult, may be as short as three to four weeks during the warm period of the year, but development is much slower during the colder months of the year. The particular type of food upon which they feed is also a factor in the length of the life-cycle. From four to six broods may occur during the year.

Control.

Products can only become moth-infested by adult moths laying their eggs on or amongst them, or by larvae which have crawled from adjacent infested materials. Cleanliness, therefore, where foodstuffs are stored or handled is essential. All accumulations of dust or particles from food products or other materials should be kept off floors and benches, etc., as all such waste materials left lying about may serve as breeding grounds for this and other pests.

When materials are to be stored, they should first be inspected, and if found to be infested with insects, should be either heated or fumigated.

Uninfested substances, packed in sealed containers, will remain free from infestation indefinitely, provided the containers remain unbroken.

Where heat is used, a temperature of 120 to 130 degrees Fahr. is fatal to all stages of the insect in a few hours, and this method of control is most useful where small quantities of materials have to be treated.

Cold storage at a temperature of 40 to 42 deg. Fahr. will prevent injury by insects.

Under certain conditions fumigation with carbon bisulphide may be undertaken. In air-tight containers this fumigant is used at the rate of 5 lb. (approximately 3 1/5th pints) to 1,000 cubic feet of air space in the container—equal to 2 oz. by weight to 25 cubic feet. This fumigant, which gives off a gas heavier than air, is allowed to act for 24 hours, after which the materials should be thoroughly aired to dispel the fumes.

WARNING.—*Carbon bisulphide is very inflammable and explosive, and lights or fires of any kind, lighted cigarettes, etc., must be kept away from it. Even heated hot water pipes have been known to cause explosion.*

Ethyl formate, a volatile liquid, is now commonly used in dried fruit packing sheds as a fumigant. The liquid is poured on top of the fruit in each box after packing, immediately before nailing the lid on. Where the fruit is stored, subsequent applications are made every two months. Ethyl formate is applied at the rate of ⅓ to ½ fluid oz. (10 to 14 ccs.) to each 56 lb. box, and from 7 to 8 ccs. for 56 lb. tins, less being used for smaller containers.

This treatment does not harm the fruit or affect its flavour. Where boxes without tin linings are used the fumigant evaporates within a few hours. The vapour in tins also disappears, but more slowly, and as a result of chemical changes, becomes formic acid and ethyl alcohol, which in the concentrations likely to be present are quite harmless.

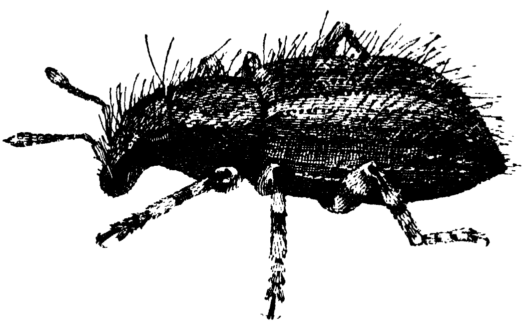
Ethyl formate is inflammable.

Weevils (*Curculionidae*) Attacking Growing Peas.

DURING last spring a crop of "Greenfeast" canning peas, in the Millthorpe district, was found to be attacked by insects. Large numbers of the plants were destroyed and some did not develop above ground.

An examination of the crop revealed that the stems of the plants had been eaten at, or near, ground level, and in many instances the stems were "furrowed" for a distance of about an inch. This injury caused the plants to wilt and die, and many vacant spaces appeared in the rows.

The damage, which was first noticed about the end of October, soon after the peas had been sown, was found to be due to weevil larvae. These grubs were very active and could be found in the soil beneath all the injured plants. Only a few pupae were present at this time, but by 12th November most had formed small earthen cells in the soil, and in these had entered their pupal or chrysalis stage.



A Prosayleus Weevil.

Larvae and pupae were also found in areas that had not been sown with peas, and were numerous in subterranean clover and native grass sward, and were abundant near the headlands.

The larvae, which measured about ½-inch in length, were pale yellowish in colour.

Two Species Identified.

Adults were developed from pupae that had been collected and it was found that two species of weevils were present. These were compared with specimens in the collections at the Australian Museum, and were identified by Mr. K. C. McKeown, as *Prosayleus dispar* and *Desiantha caudata;* the former species appeared to be the more numerous and to have caused most of the damage.

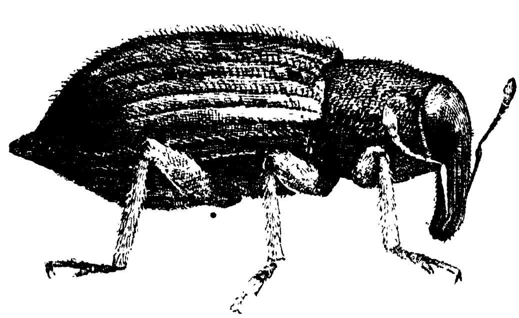
Prosayleus dispar does not appear to have been recorded previously as a pest, but a related species, *P. comosus,* has been recorded * attacking the foliage of fruit and shade trees, and vines and also the stems of young plants.

P. dispar, which measures about ¼-inch in length, is of a general grey-brown colour with small, lighter and darker markings. On the upper surface of the thorax there are two, narrow, parallel whitish bands which extend backward on to the base of the wing-covers. It is a somewhat hairy weevil, and, when newly emerged from its pupa or chrysalis, bears a pair of small cutting processes or cusps on its jaws.

The only previous mention of *Desiantha caudata* causing damage to plants in this State apears to be that of Froggatt* who recorded it attacking the foliage of fruit trees, about the middle of October, 1899, in the Condobolin district.

The adult weevil, which measures about ¼ inch in length, is of a general dark-brown colour and in the male has the ends of the wing covers produced backwards to form a small, spine-like process. On this account it has been referred to as the "spine-tailed" weevil.

It is possible that the infestation of the pea crop may have been due to adverse seasonal conditions affecting the natural food supply of the weevils or perhaps to the destruction of it by cultural operations when the ground was being prepared for sowing.



The Spine-tailed Weevil.

* FROGGATT, W. W., 1900—Entomological Notes on Specimens Received during 1899. *Agric. Gaz. N.S.W.*, vol. *XI*, pp. 644–645.

A Silver Beet Stalk Miner (*Haplomyza imitans*).

ON a number of occasions the stalks and veins of silver beet plants (*Beta vulgaris*) have been found to be tunnelled by leaf-mining fly larvae, and where the plants are severely infested the leaves wither and die.

The first occasion on which the larva of this fly was recorded in New South Wales, as a pest of silver beet, was in November, 1930, when it was found in a home garden at Leeton. It has since been recorded causing damage to silver beet in other districts including Bellingen, Belmont, Castle Hill and Cowra.

This fly was described as a species new to science by Malloch* in 1934, from specimens obtained in Sydney, where the larvae were found mining spinach, wall-flower and *Stellaria media,* during October, 1931.

The adult fly, which measures about 1/25 inch in length, is of a general greyish hue above, with a yellow head and pale yellowish markings on the body. The abdomen is mostly black, with narrow, yellow, transverse bands. This insect is related to the bean fly (*Agromyza phaseoli*), the maggots of which tunnel through the leaves and stems of bean plants.

It is possible that the standard nicotine-oil treatment, as recommended for control of the bean fly, may be effective against this pest if applied early enough. Recent experiments have demonstrated that D.D.T. sprays have been effective in controlling the bean fly, but the use of D.D.T. on plants such as silver beet, except while the plants are in their younger stages of growth, cannot be recommended, owing to the possibility of undesirable residues remaining on the leaves and stalks.

As this pest only occurs in some seasons, routine treatment, as adopted in certain areas for bean fly control, would hardly be warranted.

* MALLOCH, J. R., 1934—Notes on Australian Diptera. *XXXIV Proc. Linn. Soc. N.S.W.*, vol. *LIX*. p. 1.

Control of Black Beetle in Lawns.

THE pest known as "black beetle" causes much damage to lawns, bowling greens and golf greens in coastal New South Wales. The beetles burrow in the soil and raise small mounds above the surface, thus causing marked irregularities in the turf.

In recent experiments at Narrabeen and Smithtown, various preparations of D.D.T. and "666" were mixed with water and applied to areas of couch grass turf. An ordinary watering-can fitted with a "rose" sprinkler was used to apply the insecticides. Two of the best treatments are detailed at (A) and (B) hereunder:—

(A) *A very dilute suspension of D.D.T. in water, having* 0.08 *per cent. of the para para isomer**† *of D.D.T.*—This was prepared from a proprietary paste which, when melted, disperses in water to form a milky suspension of D.D.T., much of it colloidal in nature. One 4 oz. tin of paste was added to each 16 gallons of water, making sufficient insecticide to treat 16 square yards of turf.

(B) *A dilute emulsion containing* 0.13 *per cent. of the para para isomer of D.D.T.*—The basis of this emulsion was a commercial D.D.T. solution containing 16.7 per cent. of D.D.T. (active isomer) in solvent naphtha with emulsifier added. This stock solution formed a milky emulsion when diluted with water at the rate of one pint to 15½ gallons. The rate of application was 1 gallon of emulsion per square yard.

Each of these treatments, when applied towards evening, causes the beetles to come to the surface and exhibit symptoms of extreme poisoning. The beetles can be removed next morning by moving the turf with a lawn mower fitted with the usual grass-box attachment.

Like most insecticides D.D.T. is poisonous, so that treated grass should not be grazed by domestic animals, nor should the clippings be fed to poultry or stock. Small children should be kept off the lawn while it is still wet with the insecticide so as to avoid skin contact with the fluid.

Slight residues of D.D.T. are left on the grass after it dries but these amounts must be extremely small because, (1) nearly all the liquid passes into the soil below, and (2) the D.D.T. content of mixtures A and B is very low—even lower than the D.D.T. content of the usual fly-sprays in household use. However, the permissible amount of D.D.T. residue on greens is a matter for medical opinion to decide; meanwhile anyone who dislikes the presence of D.D.T on greens may avoid contact with it by top-dressing with screened soil after the beetles have been removed.

—C. R. WALLACE, Entomologist.

* *Heteronychus sanctae-helenae.*

† The insecticidally active form of D.D.T.

FEEDS AND FEEDING NOTES.

Contributed by
The Division of Animal Industry.

TO MAINTAIN THE PROTEIN INTAKE
With Mill Offals in Short Supply.

BRAN and pollard were, until recent years, among the most readily available and cheapest feeds for stock. A bran and pollard mash was the commonest ration for poultry, pig rations frequently contained high proportions of pollard, and bran was an almost constant constituent of cattle rations. The shortage of mill offals during recent years, occasioned by reduced milling and increased demand, has meant a decrease in the proportion of mill offals in all types of rations and an increase in the amount of crushed grain such as wheat meal, barley meal, crushed oats or grain sorghum meal.

Although it has usually been recognised that when substituting crushed grain for mill offals some increase in protein concentrates is necessary (owing to the lower protein content of grain as compared with the mill offals), the actual extent of the decrease, and the extra amount of protein concentrates necessary to correct this decrease, have not usually been sufficiently recognised.

The Use of Crushed Grain.

Mill offals contain about 15 per cent. crude protein and grains about 10 per cent. If 100 lb. of mill offals are replaced by crushed grain in a ration, the actual amount of protein would be reduced by 5 lb. or 33 per cent. It would take 88 lb. of wheat meal and 12 lb. of 50 per cent. crude protein meatmeal, or 70 lb. of wheat meal and 30 lb. of linseed meal to supply the same amount of protein as 100 lb. of mill offals.

As far as poultry rations are concerned the meatmeal percentage is often only increased by 1 or 2 per cent. when grain meal replaces a high proportion of bran and pollard. These figures indicate that this increase may be insufficient.

There are difficulties in the way of overcoming this drop in protein caused by substituting grain for mill offals, as all protein concentrates are in short supply; but as insufficient protein is frequently the most important factor limiting, for example, production of milk on poor pasture, growth of chickens, egg production or growth of pigs, every endeavour must be made to maintain the protein intake of stock at the level required for maximum production or growth.

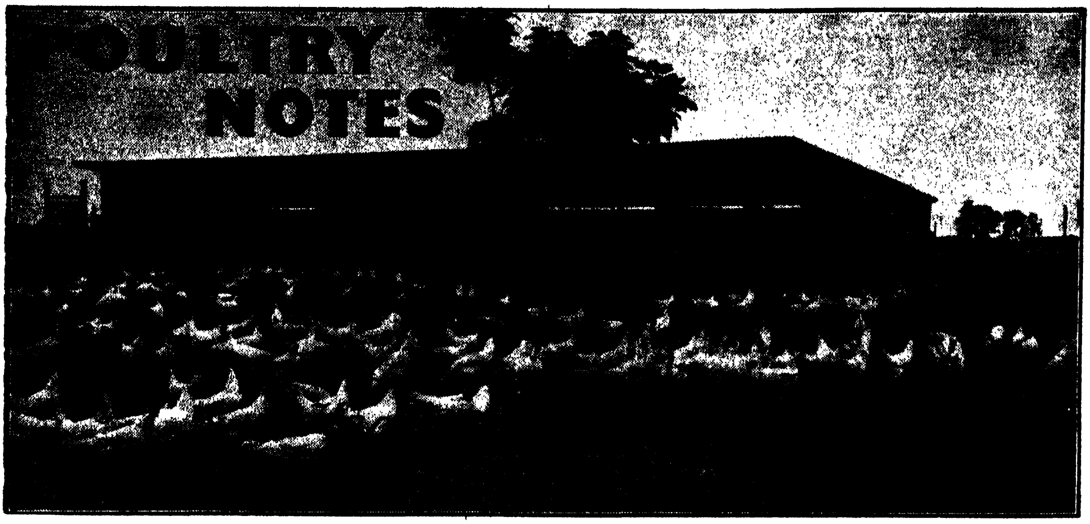
Value of Protein-rich Grazing.

In the case of cattle a sufficient protein intake can be maintained by pasture improvement (such as sowing of winter growing grasses), pasture management to ensure a continuous supply of short, leafy pasture, provision of protein-rich legume crops such as lucerne and clover for both hay and grazing and protein-rich grazing such as young oats, and increasing the protein content of cereal crops by sowing legumes such as vetches with the seed.

The protein intake of pigs may often be improved by providing them with protein-rich grazing such as the above; in fact, when pigs are provided with self-feeders of wheat and good lucerne grazing, there is usually little advantage in supplying meatmeal as a protein supplement.

For poultry the position is more difficult. They are not capable of obtaining a large proportion of their protein requirements from grazing, and the only method of maintaining an adequate protein level in poultry rations is by using such protein concentrates

(Continued on page 166.)



EGG QUALITY.

THE particulars recently published by the Egg Board regarding faults found in the "farm pack" eggs of some producers focus attention on the necessity for more care in the handling of eggs in order to ensure that they reach the consumer in the best condition possible.

This care is required, not only of those who have been entrusted to pack eggs for sale direct to retailers or consumers, but also the producers who consign their eggs to the Board floors or depots.

The industry has reached a stage when the attainment of high quality is more important than ever, not only to increase local consumption of eggs, but also to maintain a hold of overseas markets. It is essential that every producer should realise the importance of this matter.

Research work carried out during the past seven years by the Council for Scientific and Industrial Research, at the request of the Egg Producers' Council, has proved conclusively that the main cause of rots in eggs is washing by unhygienic methods or under conditions which cause bacteria to enter the shells.

Officers of this Department have participated in these experiments and are satisfied that the conclusions arrived at are beyond doubt.

Preliminary reports from Great Britain concerning eggs exported from Australia this season indicate that, following the appeal to send only unwashed eggs, the general quality shows some improvement, but here and there rots were found in numbers which suggest that some washed eggs were included.

These reports are in accord with the outturn of cases of eggs taken at random by the Council for Scientific and Industrial Research from those packed for export and kept here under similar conditions to those which would obtain in respect of the eggs sent to Britain, *i.e.*, cold stored for nine to ten weeks and then kept at room temperature for three weeks before being candled and broken to check quality defects.

In some instances, the majority of the eggs in a case were of excellent quality, but some fillers contained nearly 50 per cent. rots.

This indicates that a batch of eggs which had been washed, probably on an infected machine, had been included in the eggs packed for export.

Prevention of Rotting.

In addition to the comprehensive experiments being carried out by the Council for

Scientific and Industrial Research this season with a view to controlling rotting by means of pasteurisation with both oil and water, other investigations have been undertaken by officers of the Biological Branch of this Department on similar lines. Particulars of the work done were given in "Poultry Notes" of August, 1946, and February this year.

These methods show promise of success, but even if the process of pasteurisation is shown to be entirely effective and practicable in its application to commercial handling of eggs, it would be some time before packing floors could be equipped with the necessary machinery to treat the eggs received.

In the meantime, producers should concentrate on adopting every possible means of ensuring that the quality of the eggs is maintained. Points on the handling of eggs have previously been given in these Notes, but the main factors might again be reiterated with advantage.

HANDLING EGGS ON THE FARM.

The first requirement in the handling of eggs is to collect them regularly twice daily, particularly in the hot weather, and then place them in the coolest room available to cool down before packing or cleaning. Eggs found lying in the sun or in stray nests should not be included with the regular pack.

Keep Eggs Clean.

Dirty eggs are unattractive to the buyer and are more likely to become infected with bacteria than clean ones. In order to minimise the soiling of eggs, the houses should be kept reasonably clean. The use of some absorbent material, such as rice hulls, straw, sand or sawdust, etc., on the floors of the houses will assist in keeping the feet of birds clean. Concrete or wooden floors are most satisfactory and more hygienic than earth floors.

The advantage of collecting eggs twice daily is that soiling is avoided, and broody hens are prevented from sitting on them during the day.

Hens should be prevented from roosting in the nests at night by means of a closing device fitted to the nests, which could also be used as an alighting board.

Adequate Nests.

It is important that sufficient nests be provided to prevent breakage of eggs and soiling through the hens scrambling to lay in one nest. In this connection it is advisable to have nests divided into compartments of approximately 13 inches long by 9½–10 inches wide and 6–7 inches deep, and one nest of this size should be provided for each five hens. The nests should not be exposed to strong light as the hens prefer some seclusion when laying.

Nesting Material.

It is essential that the floors of the nests be covered to a depth of at least 3 inches, so that the eggs when laid do not come in contact with a hard surface. The most satisfactory material is shell grit or very coarse sand with a layer of rice hulls or broken straw, etc., on top. Where straw or rice hulls only are used, these materials are usually scratched out by the birds, thus causing breakage of eggs.

Prevent Breakages During Collection.

The container in which the eggs are collected should be strong enough to prevent the eggs becoming crushed. Wire buckets are now available for collection of eggs, and as these allow circulation of air through the eggs, they are more suitable than ordinary buckets or tins. Whatever type of collecting bucket is used, the bottom should be covered with a soft pad and the sides should be rigid.

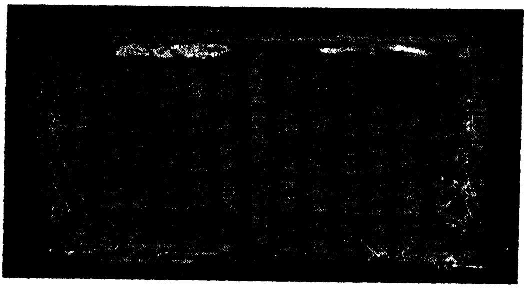
Remove Male Birds.

As fertile eggs will deteriorate more rapidly than those which are infertile, particularly in the hot weather, it is advisable to remove all male birds as soon as possible, otherwise during the summer time, embryonic development may commence, and if the eggs are held for any length of time afterwards, they are likely to go bad.

Cleaning Eggs.

Any eggs which have to be cleaned should not be washed for at least five or six hours after being laid, and the water in which they are washed should not have a lower temperature than the eggs themselves, as this is a frequent cause of rotting if the bacteria responsible for rotting are present. If washing is done by hand, it should be carried out under strictly hygienic conditions with frequent changes of water and the eggs should be dried with a cloth as soon

as possible; they should not be left in the sun or open air to dry. Dirty eggs should not be soaked in water, but can be moistened to loosen the dirt and then be cleaned by washing in clean water.



Case with Sides Removed to Show Correct Method of Packing.
Note woodwool pads on the bottom and woodwool packing at the ends of fillers to prevent undue movement; also crumpled paper pad on top.

If the eggs are cleaned on a washing machine, great care is necessary to disinfect the machine thoroughly daily, and it is advisable to use a non-tainting disinfectant in the water trays. The quantity of disinfectant to use would depend upon its chlorine content; a suitable concentration is .3 per cent. of available chlorine, and the supplying chemist could advise on the quantity required to provide this concentration.

Even under the best of conditions, however, it is difficult to sterilise egg washing machines effectively. The aim should be to produce as many clean eggs as possible and thus reduce the number to be washed to a minimum.

Packing the Eggs.

Care should be exercised in the packing of eggs to prevent breakages and tremulous air cells. It is important that the eggs be packed with the small end downwards and that no eggs stand above the top of the fillers. If eggs are packed with the large end downwards and they have to travel a long distance, it is likely that a large number will develop tremulous air cells, which would result in classification below first grade. There is also more risk of breakage when the eggs are packed with the large end downwards as the broader surface has less resistance and any rough handling would cause cracks in the shell.

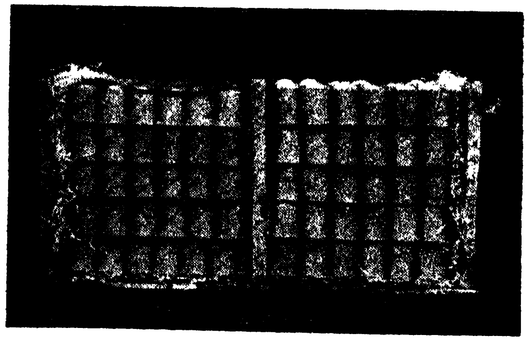
The Use of Pads.

One of the first considerations in packing eggs is to ensure that a fairly thick pad is placed on the bottom of the case to prevent any jarring, and also above the top flat between the flat and the lid of the case. Normally woodwool pads are supplied with cases, but if these are not available, a pad of straw or dried grass or even a double sheet of newspaper crumpled up should be placed on the bottom in each half of the case, spread evenly over the bottom. This should be followed by the first flat and then the filler. Where there is much space between the sides or ends of the case and the fillers, it is advisable to wedge a little woodwool or crumpled paper in the space to prevent too much movement.

If the eggs have to be transported over rough roads, it is a good plan to place some padding on the floor of the vehicle, and thus reduce the jarring, especially where a light load is being carried.

Hints on Packing.

Before packing the eggs in the fillers see that both fillers and eggs are thoroughly dry, as any moisture will result in staining the eggs and also provide favourable conditions for the development of bacteria.



The Same Case, showing Correct and Incorrect Ways of Placing Eggs in Fillers.
Left.—Correctly packed—the ends of the eggs do not show above the filler.
Right.—Incorrectly packed—the eggs project above the filler.

Large eggs which fit tightly in the fillers should not be included, as they are most likely to be broken, but eggs slightly larger than normal hen size can be placed in the corners of the fillers or along the sides, where they can be tilted slightly so that they do not project above the fillers.

Attention to the details outlined will greatly assist in avoiding breakages and quality troubles.

OMPHALITIS OR NAVEL INFECTION OF CHICKENS.

L. HART, B.V.Sc., H.D.A., Veterinary Research Officer.

OMPHALITIS means inflammation of the navel, but the term is commonly used to denote inflammatory conditions which arise from infection through the navel.

In recent years the disease has caused serious losses. Mortalities of 15 per cent. have frequently been experienced, and in isolated cases, losses have been even higher. Many hatcheries have encountered the disease.

During the development of the chick embryo the intestines and yolk sac are located outside the abdomen. About the fifteenth day of incubation the intestines are withdrawn into the abdomen; on the nineteenth day the yolk sac also begins to retract and by the twentieth day has entirely entered the abdomen. The umbilicus or navel becomes completely healed and impervious to germs. As the result of unknown causes the navels of some chickens are sealed imperfectly or are slow to heal. During this time the yolk sac is in contact with the navel, and any germs entering the navel readily reach the yolk sac which affords them ideal conditions for rapid multiplication. In some cases the organisms multiply in the tissues surrounding the navel. The disease so caused is known as omphalitis or navel infection.

Unlike pullorum disease, navel infection is not caused by a specific germ, but may be caused by a variety of germs, most of which are widespread on farms.

Two Types of the Disease.

Two types of disease occur:—

1. *Infection of the Tissues Around the Navel.*—In this type of infection practically all deaths occur within about three days of removal of chicks from the incubator. Affected chickens usually are dull, listless and refuse to eat. A scab is often present over the navel, and the down surrounding the navel may be wet. The skin surrounding the navel is usually discoloured, often being blackened and spongey or watery. Chickens dying from the disease quickly putrefy and develop a foul odour. The yolk sac is also usually involved.

2. *Infection of the Yolk Sac.*—In this case there may be no external changes to indicate the cause of death. Losses may occur up to several days after hatching, but the heaviest mortality is usually within the first five days. Affected chickens are depressed and eat little, but no characteristic symptoms are shown. On handling, the abdomen is often found to be distended, and in some cases many affected chickens swell rapidly within a short time of hatching. Post-mortem examination reveals an enlarged yolk sac with abnormal contents, the yolk being massed in cheese-like lumps, or being watery and containing gas bubbles (normally the yolk sac contents are approximately the same colour and consistency as normal egg yolk; this yolk is utilised by the chicken and should be completely absorbed within about seven days). The yolk sac may be ruptured and usually there is peritonitis, exudate being deposited on the various organs.

Differential Diagnosis.

It is necessary to differentiate the disease from pullorum disease and losses due to faulty management. Laboratory examination is usually necessary to arrive at a correct diagnosis.

Pullorum Disease.—Mortality usually commences when chickens are two to four days old and the death rate rises to about the tenth day and then slowly recedes; whereas in navel infection the heaviest mortality is usually within the first five days, and deaths from it rarely occur after about the eighth day. Navel infection and pullorum disease can, of course, occur concurrently in a chicken or batch of chickens. Characteristic changes can usually be seen in pullorum disease (cheesy masses in the lungs, discolouration of liver, cheesy plugs in the blind guts).

Faulty Management.—This may consist of insufficient or, more rarely, too much heat in the brooder, failure of chickens to commence feeding (most likely in heavy breeds in battery brooders) and poor quality rations.

Control Measures.

Practically no investigational work has been done on this disease.

Studies on incubator hygiene have shown the necessity for scrupulous cleanliness in order to control pullorum disease, and the effectiveness of fumigation* with formalin in destroying the germs of pullorum disease left in an incubator from preceding hatches has been demonstrated. Formalin fumigation is likely to be effective against all germs which do not form spores. However, such fumigation can be carried out only until the chickens commence to hatch.

In a forced draught incubator, air is passed rapidly through the machine so that shortly after the last fumigation the formalin has been dissipated and the air within the machine is a sample of the atmosphere in the incubator room, unless the ingoing air is filtered in some way. It is at this time that the chickens' navels become exposed to germs in the air within the incubator.

Thus it will be seen that unless the ingoing air can be filtered to remove the germs, or a chemical harmless to chickens but deadly to germs can be kept dispersed in the incubator atmosphere, the next most important thing apart from incubator hygiene is *incubator room hygiene*. Incubator rooms should be built well away from feed sheds and brooder houses, and preferably should be surrounded with lawns. They should be kept scrupulously clean (including tops of incubators) and spraying the floors, benches and walls with 2 per cent. formalin or 3 per cent. lysol at regular intervals is desirable.

Although dirty incubators increase the risk of navel infection, heavy losses from the disease have frequently been seen where incubators and incubator rooms have been kept very clean.

Prevention is the keynote of control, and treatment of affected chickens is of no avail.

*A leaflet on fumigation and disinfection is available free, on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

On His Return from Leading the Stud Stock Buying Delegation the Hon. E. H. Graham, M.L.A., Minister for Agriculture, Broadcast during the Agricultural Session of Station 2 SM.

This Station has conducted an Agricultural Session for the past twelve years.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Armstrong, K. A., "Heathfield," Boorowa	23	18/12/46
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, E., "Austral Park," Berry (Jerseys)	88	14/1/47
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	29	5/3/47
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrcshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	261	25/9/46
Knight, G., Tannabah, Coonabarabran	60	30/11/46
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys)	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	19/11/47
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	155	11/3/47
Wagga Experiment Farm (Jerseys)	15	1/2/47
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys)	110	16/3/47
Young, A., "Daylesford," Cudal (Beef Shorthorns)	83	25/2/47

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	52	26/6/47
Aboriginal Station, Wallaga Lake	19	29/4/47
Australian Missionary College, Cooranbong	100	30/8/47
Barnardo Farm School, Mowbray Park	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell	134	16/8/47
Goulburn District Hospital	[illegible]	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood	23	29/4/47
Hannaford, A., Braidwood	10	1/2/47
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	27	16/2/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	79	8/3/47
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
McGuffícke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville	21	8/8/46
New England University College, Armidale	19	1/5/47
Orange Mental Hospital	63	19/3/47
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
Rolfe, V. J., "Mount View," Inverell	18	9/2/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter	66	23/4/47
Wilton, C., Bligh Street, Muswellbrook	54	12/5/46
Youth Welfare Association of Australia	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Apiary Notes—*continued from page* 154.

rate to other colonies previously established there. No doubt they put in quite a time searching around the country on the look-out for lucerne fields before being properly influenced to work on the ironbark trees. The same beekeeper observed a similar reaction when apiaries were moved to lucerne country from a locality where reasonably progressive work was being carried on amongst flowering trees.

Feeding Notes—*continued from page* 159.

as are available, including peanut meal, linseed meal, coconut meal, meatmeal or blood meal. Protein-rich green feed (young and leafy) will help, of course, to some extent. Linseed meal should not be fed in amounts greater than 5 per cent. to chickens, as results of recent experiments indicate that at least certain samples of linseed may, if fed in amounts greater than this, affect growth or actually cause losses. However, linseed meal is quite suitable for all other stock and older poultry.

Danger of Harmful D.D.T. Residue on Vegetable Crops.

A WARNING is issued by New South Wales Department of Health, in conjunction with the Department of Agriculture, concerning the risk to consumers from the indiscriminate use of the insecticide D.D.T. by vegetable growers, and the danger of statements discounting the toxicity of the preparation.

Owing to the wide publicity given to its efficacy, this new insecticide is now being used extensively for the control of insect pests on the edible portions of various crops. It is apparent in many instances, that no consideration is given by growers to the possible ill-effects of D.D.T. on the health of the community, and plants such as lettuce and cabbages are being marketed which contain appreciable amounts of it.

While D.D.T. is not regarded as such a dangerous poison as arsenic, which has, of course, been used extensively for many years in the protection of plants from insects, it is nevertheless poisonous to man and lower animals. What is more important, however, is that D.D.T. is now regarded as an extremely cumulative poison, and the indiscriminate and careless use of it may expose the public to the ingestion of continuous amounts which may eventually have injurious effects.

In the light of present knowledge on this matter, the Departments are diffident about recommending the use of this preparation on the edible portions of plants, and growers who are so using it are warned of the potential danger of the practice, and of the necessity for at least observing the precautions adopted with arsenicals. In every case there should be a period of one month between the last application of D.D.T. and the marketing of the product.

Manufacturers of D.D.T. products are also advised that the terms "non-poisonous," "non-toxic" and "harmless to man and animals" should not be used on their labels, for not only is D.D.T. poisonous, but these terms may deter people from taking proper safeguards and also remedial action in cases where D.D.T. products have been inadvertently swallowed, especially by children.

Nevertheless, used with discrimination D.D.T. is a most useful insecticide.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Government Agricultural Training Farm, Scheyville.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, C. C., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Waterfall Sanatorium, Waterfall.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Higgins, J. P., " Koranga," Camden.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., " Elwatan," Castle Hill (Jerseys) ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hann, O., " Bomerah," Barrington (Jerseys)	55
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., " Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., " Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., " Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., " Nareogullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	135
Robertson, D. H., " Turanville," Scone (Polled Beef Shorthorns)	90
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., " Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Young, A., " Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	45
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale ...	62
Gladesville Mental Hospital	9
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	72
Reid, D. B., " Evandale," Sutton Forrest	24
Royal Prince Alfred Hospital, Camperdown, " Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Some Common Causes of Bloat in Cows.

BLOAT, or hoven, in cows is due to succulent foods eaten under certain conditions, which cause the formation of large quantities of gas in the rumen or paunch, and in consequence a swelling on the left flank. It is more often seen—

1. When cattle are turned hungry on to such succulent green food as lucerne, clover, trefoil, etc.

2. When cattle accustomed to dry feed are suddenly changed on to soft green food.

3. When travelling cattle are allowed free access to large amounts of green food such as variegated thistle.

4. When cattle gorge themselves on wet grasses or herbage.

5. When cattle eat the leaves of certain trees, such as willows, kurrajong, etc., especially if they have access to water soon after.

6. When cattle are fed on certain roots or potatoes under certain conditions, chiefly in the raw state, or should they become stuck in the gullet.

Such poisonous plants as hemlock and deadly nightshade may cause acute hoven. Again, hoven may be often seen in cattle where rumination has ceased, as in dry bible. Some cattle seem to be more subject to hoven than others.

Every effort should be made to prevent the occurrence of hoven in stock by guarding against the predisposing causes. In feeding lucerne, clovers or trefoils, if the animals are not used to such fodders they should be put on to them gradually until they become accustomed to them. If lucerne is fed in a wet state or after heavy rain (when it is soft and juicy) it will almost always cause trouble, and cattle should. therefore, be kept off it until it is drier.

Driving animals which have been feeding on the above succulent foods should be avoided.

In all acute cases of hoven, no matter what form of treatment is adopted, it should not be delayed, as the animal's life will depend on the quick removal of the gases. Methods of effecting this are given in the departmental leaflet from which the foregoing paragraphs are taken. It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

A Home-made Cream Cooler.

IF cream is to reach the factory in good condition it must be properly cared for from the time it leaves the separator, and the first requirement is to cool it immediately it comes out of the cream spout. Running the cream over a water cooler is the method of cooling generally employed, but where such a cooler is beyond the farmer's means an ordinary tin billy can be adapted to the purpose, and its use is much to be preferred to neglect to cool the cream at all.

The can is hung on the spout of the separator, holes large enough to allow free passage of the cream into the bucket placed beneath it being punched through the bottom of the can from the inside. Cooling and aeration take place as the result of the cream falling in drops from the billy can through the holes. These holes are so numbered as not to allow any weight of cream to remain in the billy. All seams of the billy should be soldered flush so as to facilitate easy cleaning. The holes. being punched from the inside of the can, allow the cream easy exit. They should be smoothed of all rough edges.

Some farmers run the cream into a can standing in water. This is satisfactory if the cream is often stirred, otherwise only the cream nearest the can sides is cooled.

If a water cooler is used, the water must be of low temperature, and this can be ensured by having an underground source of water supply. Such water is generally fairly cool and does the job well. Failing this, a tank, elevated and in a cool position, is satisfactory. Cream coolers are sometimes coupled to a canvas water bag. This also answers the purpose, but the bag should be large enough to hold sufficient water to cool all the cream from each milking.—DIVISION OF DAIRYING.

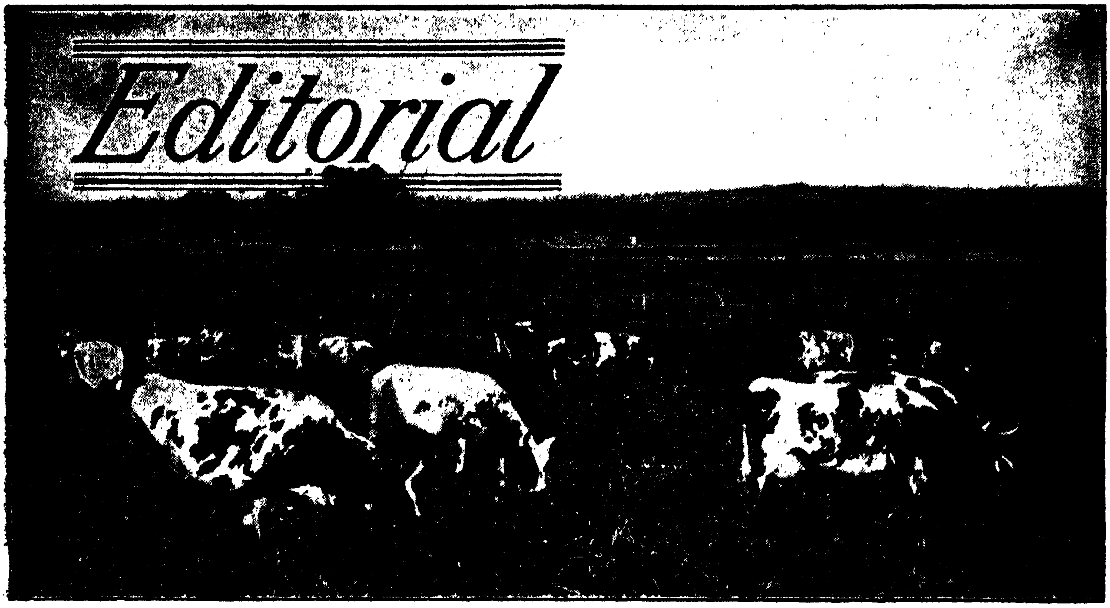
Value of Pig Manure.

ALTHOUGH pigs are fairly efficient in the conversion of plant matter to animal matter, over 70 per cent. of the nitrogen and over 90 per cent. of the phosphorus and potassium of the feeding stuffs is excreted by even a growing pig. Taking, for example, a baconer which during its life consumed some 8 bushels of wheat and 30 lb. of meat meal, the amount of nitrogen, phosphorus and potassium in the excreta would be equivalent to about 50 lb. of sodium nitrate or ammonium sulphate, 30 lb. of superphosphate and 4lb. of potash.

Thus it can be readily seen that if the excreta from pigs is efficiently utilised, there is a considerable return or saving per pig. A method of utilisation of these fertiliser constituents which has proved successful is to use the wash water from the sties for irrigation purposes. Excellent stands of maize have been produced by this practice.

THE AGRICULTURAL GAZETTE FOR APRIL, 1947.

This Issue Contains:—



The Agricultural Gazette.
APRIL, 1947.

Electricity for Farms.

ONE unit of electricity used to advantage on a farm is equal to the labour of eleven men for one hour; it will milk a cow for one month; or it will shear 100 sheep. Cost of a unit varies from about 7d. when only 1,000 units a year are used, to something like 1¾d. when 10,000 units are consumed.

Undoubtedly, electricity means cheaper production costs in our primary industries. Although there would appear to be no great difficulty in generating electricity sufficient to meet rural needs, distribution lines to carry this cheap power to widely separated farms is inordinately costly. That is the real obstacle to electrification of farming in this country.

To overcome that obstacle is the big job of the Electricity Development Authority, brought into being by the New South Wales Government last year. It realised that the burden of financing distribution lines was too big to be borne by primary producers alone.

About 62,000 rural holdings are within reach of present or projected electricity supply schemes. Only 12,000 are being served now. The Electricity Development Authority plans to assist councils, shires or other local supply authorities to connect, within the next ten years, 60 per cent. of all farms in New South Wales with electricity supply.

Total cost of reticulation lines and essential equipment of this ten-year plan has been estimated at £6,000,000 of which about £2,750,000 will be paid to local bodies by way of subsidy. Some of the funds for subsidy payments will be provided by Government-imposed levies on large urban electricity undertakings.

The whole community will benefit from this venture; the whole community will help shoulder the cost. Whilst primary producers (and their families) will benefit directly by having power for cheaper, greater and perhaps more efficient production, and the farmer's family by electricity-equipped homes, urbanites will share in the improved prosperity of the State.

Increased income, even when obtained with less manual effort, does not necessarily mean a higher standard of living. Improved amenities in the home and in the community determine to a greater extent the standard of living. Electrification of rural holdings will provide most of the facilities which go to make for individual and community contentment and prosperity.

Cattle Slaughtering, Diseased Animals and Meat Act Amended.

THE object of the Cattle Slaughtering, Diseased Animals and Meat (Amendment) Act, 1947, is to transfer certain activities of the Board of Health to the Department of Agriculture.

Referring to the amending Act, Hon. E. H. Graham, M.L.A. (Minister for Agriculture), said that under the Cattle Slaughtering, Diseased Animals and Meat Act, the Board of Health had certain supervisory powers which have now passed to the Minister for Agriculture. The chief reasons which underlay this action were the desire to co-ordinate all work in connection with the health of livestock in the Department of Agriculture. That Department was the only one at the present time which employed a veterinary staff, although many years ago the Board of Health had such officers on its strength.

"In those countries in which meat inspection has reached the highest standard, the control and supervision of the work is placed in the hands of veterinarians, and in many countries such as New Zealand, Canada, and the U.S.A., the meat inspection staff is incorporated in the Department of Agriculture," said Mr. Graham. "The information secured in meat inspection is of very considerable value to the staff dealing with the control of infectious disease, and it not infrequently happens that the first indication that a particular disease is present in a district is secured from animals killed at centres at which inspection of meat is provided. It will now be possible to make such arrangements as will bring about regular and early reporting of disease conditions, and such reporting will provide for the immediate notification of these diseases to the nearest veterinary officer or Inspector of Stock. The Department of Agriculture has a veterinary staff widely distributed in the State and this staff will be steadily augmented.

"Apart, however, from the disease control aspect, it is felt desirable that the highest scientific knowledge should be available in connection with meat inspection in order to protect consumers of meat and the employees or other persons working in slaughterhouses from infection.

"It must be remembered that the operations of this Act are not State-wide, as in the County of Cumberland the Meat Commissioner is the authority, and some few municipalities have established abattoirs under their own control. The amendment of this Act will not interfere with either of these organisations, and it has been provided in the amending Act that the authorities granted to officials of the local governing bodies whilst under the Board of Health will be continued. The Local Authorities can be assured of full co-operation in their important work by the Department over which I preside."

Assistant Director of Agriculture.

Dr. H. J. Hynes Appointed.

Dr. H. J. Hynes, formerly Chief of the Division of Marketing and Agricultural Economics, has been appointed Assistant Director of Agriculture, a newly-created position within the Department of Agriculture.

Announcing Dr. Hynes' appointment, the Minister for Agriculture, Mr. Graham, said that the Assistant Director of Agriculture would assist with the supervision and direction of the educational and technical work of the Department, and with the co-ordination of its research and extension activities.

Dr. Hynes would also be required to carry out the duties of Executive Officer of the N.S.W. Advisory Committee on Co-ordination of Agricultural Research, which is under the Chairmanship of Mr. W. C. Wurth, Chairman of the Public Service Board. This Committee, said Mr. Graham, was recently set up by the Government, and comprises the permanent heads of the Departments of Agriculture and Conservation, Executive Officer of the Council of Scientific and Industrial Research and the Professor of Agriculture of Sydney University. The Committee's function is to advise the Government on co-ordination of work in agricultural research with a view of preventing overlapping of activities.

Dr. Hynes joined the Department of Agriculture in 1919 as a scientific cadet. He graduated B.Sc.Agr. (Honours) at Sydney University in 1923, was awarded the Walter and Eliza Hall Research Fellowship, 1923-1925, and studied in U.S.A., where he graduated M.Sc., Minnesota, 1925. In 1936 he graduated D.Sc.Agr., Sydney University.

He was appointed Chief Biologist of the Department of Agriculture in 1940 and in 1943 became Chief of the Division of Marketing and Agricultural Economics. During the war years, Dr. Hynes was seconded for work as Administrative Officer, State War Co-ordination Committee, and later, Commonwealth Assistant Director of Rural Manpower.

THE VALUE OF AIRCRAFT TO THE PRIMARY INDUSTRIES.

A Summary of Present and Potential Uses in Australia.

DURING the war years many of our young men saw much of the use of aeroplanes for the transport of large numbers of men and great quantities of equipment of all types. 'Planes were used during the war to perform many new tasks, and every day now we read of the adaptability of modern types of aircraft. Small wonder that we ponder the limitations of their use. It is only natural that those interested should consider the ways in which these machines might be used in agriculture.

Recently, the Department had occasion to survey the agricultural uses to which aircraft have already been put and to consider their potentialities for this purpose. The information collated is set out below.

Types of Aircraft.

If we consider the types of aircraft available, it will be found that very few are really suitable for agricultural purposes. The single-engined types whilst cheaper to buy compared to larger aircraft, have a very poor weight-lifting capacity—something up to 900 lb. This type would have only very limited use. If the multi-engined aircraft are considered, we come up against a very high initial purchase price (say, £60,000 for a Douglas), high consumption of petrol and the problem of trained crews, hangar space, spare parts, runways, etc. A Douglas can lift approximately 8,000 lb., but each engine uses about 32 gallons of 90 octane petrol an hour, and for larger aircraft the consumption goes up to 45 gallons per hour. For any such machine to be an economical proposition, it would need to be in constant use and not left in the shed or hangar. With large aircraft in the R.A.A.F. as many as four men were detailed to look after each machine constantly. This number could probably be reduced in peace time especially if fully qualified men were available. To get fully qualified men, it would be necessary to pay good wages and provide good conditions.

Aerial Surveys and Photography.

One of the important ways in which aircraft may be of use to rural development and even to the establishment of primary industries is for the purpose of making aerial surveys. Combined with aerial photography, such surveys would provide information within a few days which might otherwise take much longer to secure by land travel. In this way the conditions as to pastures, water supplies, shelter, etc., of large areas could be ascertained, and rapid surveys of the movement of cattle could be made satisfactorily from the air.

Aerial survey and photography would also be of very great assistance in mapping vegetation and in ecological studies. Particularly valuable assistance was obtained from aerial photography combined with ground surveys when the Murrumbidgee Irrigation Area was originally plotted.

Sowing and Topdressing Pastures.

There are possibilities in the use of aircraft for the rapid transport of seeds, fertilisers, machinery, etc., over great distances, probably enabling the development of areas suitable for cultivation which have hitherto remained unused because of the lack of transport.

The sowing and topdressing of pastures is a practice that has long been a recommendation of this Department, and every chance has been taken to stress its value to the farmer. It is only natural to wonder whether seed can be sown and fertiliser distributed from the air. It might appear that the job could be done and large areas covered very quickly, which would be an advantage especially in areas of limited rainfall.

There are, however, several serious drawbacks to the use of aircraft for this type of work.

In the first place, the amount of fertiliser that could be carried (900 lb. for small aircraft and 8,000 lb. for a Douglas)—enabling the treatment of 9 and 80 acres

respectively at 100 lb. per acre per trip—would be used up in a very short time, and would thus necessitate many takes-off and landings at the central depot, which might be some considerable distance away from the area being treated.

A second handicap would be the accuracy of application. Even if we assume the spreader equipment is efficient, no pilot could be expected to fly accurately up and down a paddock and drop fertiliser on new ground each trip. Spots would be missed due to pilot error, wind surges, and the different weights of the grains of fertiliser would cause the heavy particles to drop quickly whilst the powder would float downwind. Again work could not be done on very windy days, in rain, fog, dust or ground haze.

The flying of any aircraft near the ground, especially at low speeds, is extremely dangerous and was the cause of many deaths in the R.A.A.F. This work could be more efficiently done on inland areas where the paddocks are large and reasonably free from timber than on the coastal areas where the paddocks are smaller, the country more hilly and weather conditions more variable.

A very high degree of co-operation would be necessary between the pilot and ground staff in the marking of the area and the correct placing of the fertiliser.

It might be considered that planes could be used for topdressing inaccessible places. However the topdressing of very steep, broken slopes, gullies, rocky knobs, ridges, etc., is of very doubtful value. In the first place these areas are usually of very poor soil and the response to fertiliser is often very slow. In heavily timbered areas it is doubtful if all the fertiliser dropped would reach the ground, and if it did the grass growth would not be excessive due to shading and competition from the trees and shrubs.

The sowing of grass seed from the air would present similar difficulties to the use of fertilisers. The weight of sowings per acre is certainly much lighter and greater areas per load could be covered, but the mixture would not be accurately sown due to the downwind drift of the lighter seed in the mixture. The seed would merely be dropped on the surface of the soil, and in many cases a poor germination would result. This type of planting might possibly be of some value in the Western Division after good rains where speed is the main essential.

The Transport of Perishable Products.

The use of aircraft for the transport of perishable agricultural products, such as fruits and vegetables, is envisaged as likely to be commercially adopted in Australia on an extensive scale in the future. The widespread use of aircraft for transport of freight of this nature during the war period has focussed attention on the possibilities. Already since the cessation of hostilities fairly regular transport of certain fruits and vegetables has taken place between Sydney and Melbourne (a distance of 400 miles), between Melbourne and Hobart (275 miles), between Hobart and Sydney (600 miles), between Brisbane and Melbourne (900 miles), and between Perth and Adelaide (1,400 miles). Products transported have been brussels sprouts, beans, peas, tomatoes, asparagus, mushrooms and strawberries.

The principal advantage to be gained by air freight is that it enables the quality of the product to be maintained during the marketing process. In the transport of certain produce, *e.g.*, tomatoes, the distance of travel is often as great as 1,400 miles. This involves a minimum of 7½ days' travel by rail. By air, the time required for transit would be about 7 or 8 hours at the most.

Obviously, air transport of perishables has much to commend it, and of course opens up the possibility of developing new markets in adjoining countries not hitherto provided with products of this nature.

The most important factor in determining the air cargo potential is obviously the freight rate. In Australia, air transport rates are about 25 times higher than railway rates for perishable primary products, and it is to be expected that much more produce would be transported by air if freight rates were lowered.

Control of Insect Pests.

The use of aircraft for the control of insect pests has received very little attention in Australia. Under present conditions insect pests attacking crops of any kind can be adequately and more economically handled

by ground equipment such as power spraying and dusting machinery. At present there are no large continuous areas of crops requiring treatment where the use of aeroplanes might be an advantage, such as they are in the cotton crops of the United States.

A Flying Veterinary Service.

With regard to the livestock industries, it is considered that there are many ways in which the utilisation of air transport can be of considerable value. In countries of long distances the air transportation of vaccines and sera would save so much time that it might well be responsible for preventing serious stock losses and transport of the veterinary staff by air could be effected at the same time.

In isolated cases, such as occurred in New Guinea, air transport of milking cattle or goats may be the only means of transporting such animals to isolated communities, and thus securing the supply of one of the main protective foods to such isolated communities which are often in danger of suffering as a result of lack of these foods.

At times it has happened with livestock isolated by flood in Australia, that quantities of fodder have been transported by aeroplane to an extent sufficient to enable them to survive pending the clearing of the flood waters.

Valuable results which have been obtained from the use of aircraft on patrol over forest areas and the systematic development of such a service should provide the

Dusting Citrus Orchards in California, U.S.A.
[After Morrel and Falls.

When artificial insemination is practised the use of the aeroplane for the transport of semen would, in view of the brief period of viability of semen, enable satisfactory work to be done where it might be impossible with land transport.

Stock Transport.

If the cost of air transport renders it financially sound, there is no doubt that the aeroplane will be used for the movement of small numbers of stud stock and show stock. This will, or may, add to the difficulties of disease control, but it is quite obvious that it will develop irrespective of such increase.

means of infinitely greater control of forest fires, with resulting reduction of losses of valuable timber, pastures and crops.

The Cost Factor is All Important.

It will be seen from these facts that while there is scope for utilisation of aircraft in the agricultural and pastoral industries, there are, unquestionably, limitations which affect successful developments at the present time.

The cost factor must inevitably be taken into consideration and, under present conditions, the question seems to be whether the results to be obtained would be justified by the costs involved.

THE CONSTRUCTION OF CORRUGATED GALVANIZED IRON TANKS.

IN the construction of corrugated galvanized iron tanks 24-gauge iron is generally used, and it can be procured already curved to the sizes required. For a tank of 200 gallons capacity, two sheets 10 feet long would be necessary, curved to a full circle and joined by a 4-inch lap (*see* Fig. 1).

The method most often adopted in riveting the seams is to clamp a small hand-vise at the top and bottom, then put in a couple of rivets at each end, after which the hand-vises may be removed. Small galvanized roof bolts can also be used to hold the iron in position.

The holes for the rivets are punched from the outside, a piece of hardwood being held on the inside as a "dolly"; the rivets are distributed about 2 inches apart, or one to each corrugation. The rivets are put in the holes from the outside, an iron dolly being held to the heads, the washers placed in position, and the rivets hammered down and snapped on the inside.

The second cylinder of the tank is fastened at the top, and then placed over the first cylinder (*see* Fig. 2), and lowered until the required lap is reached; one or one-and-a-half corrugations should be sufficient

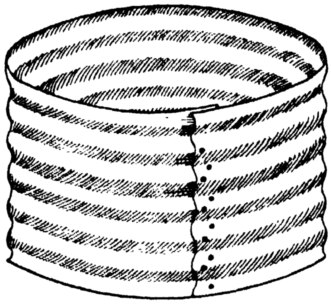


Fig. 1.

in a small tank. A rope is then passed round the body of the tank, with a short piece of pipe to form a tourniquet or twitch, and this is tightened until the seam is in position (*see* Fig. 3). Punching and riveting are then proceeded with.

A tank that consists of two sections only should have the vertical seams on opposite sides. Taking the line of the corrugations as a guide, the joint round the centre of the tank is easily adjusted, and should have a single line of rivets about 8 inches apart.

The next operation is to turn a flange on the body of the tank in preparation for the fitting of the bottom. This is done as shown in Figs. 4 and 5. As the tank now stands, the top or outside cylinder will be that to which the bottom is fitted. A line is drawn half an inch from the top edge, and the flange beaten over on a "hand-stake." Where this tool is not available, an ordinary laundry flat iron makes a very good substitute. For the bottom, one sheet of 24-gauge galvanized flat iron, 72 x 36 inches, will be required. As this sheet will not be wide enough for the full diameter of the tank, it will need to be cut and joined together by a grooved seam (*see* Fig. 6). To form the seam a 5-16 inch seaming tool or groover is used, the raised side of the seam being kept on top to go inside the tank. To insure a neat fold round the bottom it is necessary that the grooved seam be thinned down at each end (*see* Fig. 8).

The tank is then turned over, and the flanged end laid on the sheet of iron, and scribed round with a small pair of compasses (Fig. 7), a margin of ⅜-inch being allowed for the turn-up. This method of striking out a tank bottom is usually adopted when compasses sufficiently large are not available. Care should be taken in its operation, as if the measurements are not fairly accurate, buckling and distortion may occur later.

The bottom being cut out, it is now placed on a bench, and flanged to the line previously marked. This is done by placing the flat iron on the line, and beating the marked margin up to nearly a right angle, as shown in Fig. 8. Then the body is fitted to the bottom as in Fig. 9, and the flange closed down as in Fig. 10. A hole should be punched for the tap near the bottom of the tank (*see* Fig. 17), large enough to allow a ¾-inch water pipe socket to enter. A 2-inch hole is also cut close to the top for an overflow outlet (Fig. 17). The top edge of the tank may now be flanged over, as was previously done for the bottom.

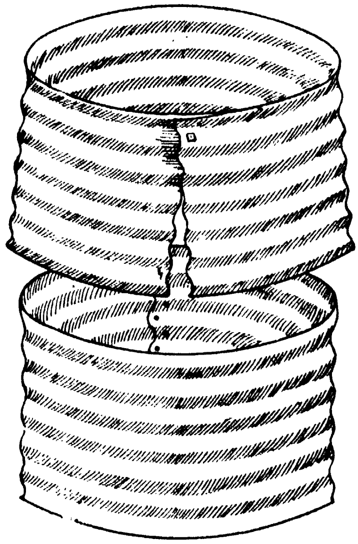


Fig. 2.

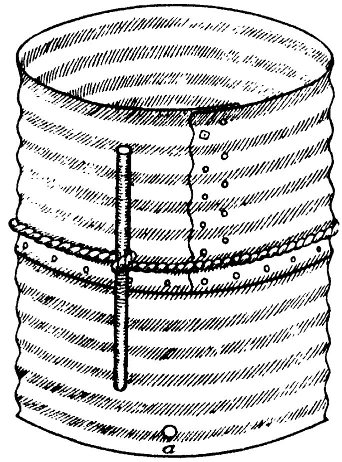


Fig. 3.

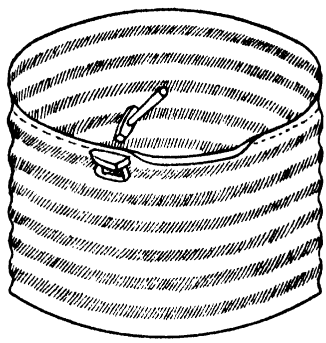


Fig. 4.

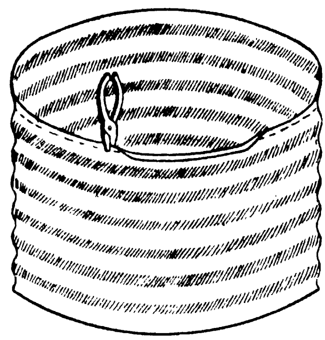


Fig. 5.

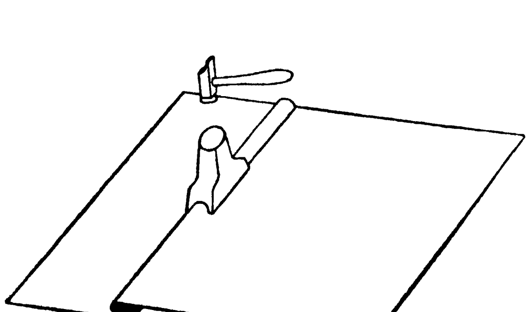


Fig 6.

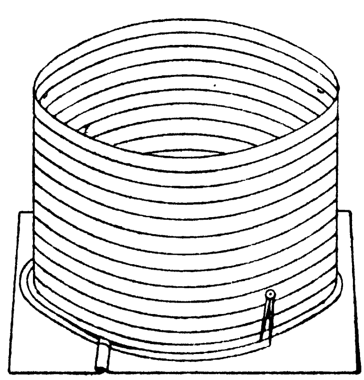


Fig. 7.

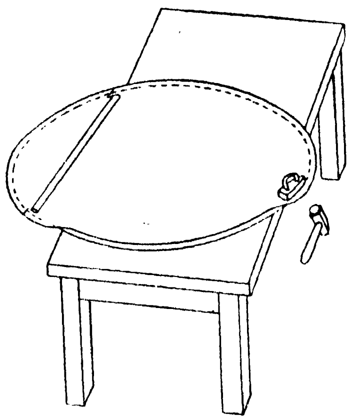


Fig. 8.

Fig. 12.

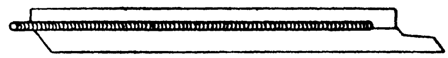


Fig. 13.

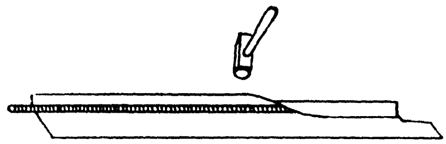


Fig. 14.

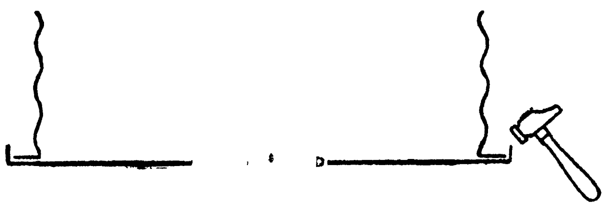


Fig. 9.

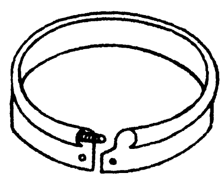


Fig. 15.

Fig 10.

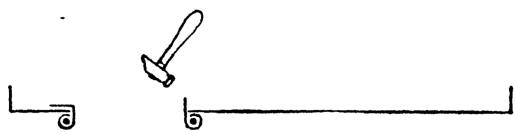


Fig. 16.

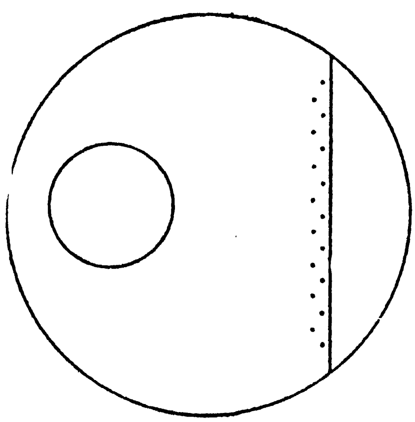


Fig. 11.

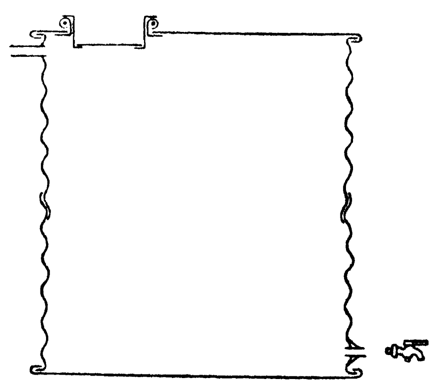


Fig. 17.

For the lid, one sheet of 26-gauge galvanized plain iron 72 x 36 inches will be needed, and this should be cut and joined with a grooved seam as with the bottom (Fig. 6), or riveted as in Fig. 11.

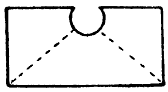


Fig. 18.

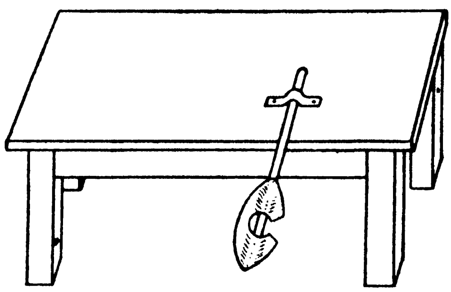


Fig. 19.

Fig. 20.

The lid is marked out as in Fig. 7, and a 15-inch circle struck for the mouth or manhole; this can be placed in the centre or near the side as required. The flange is then beaten up as in Fig. 8.

Around the mouth a strengthening collar is usually placed. This is made by taking a strip of plain galvanized iron about 2 inches wide, and of a length sufficient to circle the opening and allow of a 1-inch overlap, and cut as in Fig. 12. It is now turned up as in Fig. 13, and a rod of ¼-inch round iron of similar length is enclosed (Fig. 14), three-quarters of an inch of the round iron being left protruding at the lap end to strengthen the joint. Next, round the collar up as shown in Fig. 15, and secure with a small rivet. Insert the collar in the mouth, and beat the flange over, as in Fig. 16.

In fitting the lid to the tank, the same procedure is followed as with the bottom. Fig. 17 shows the lid in position. A movable strained is usually let into the mouth of the tank (*see* Fig. 20).

Research work on the life of tanks has indicated that an open or well ventilated top will result in a longer life than is obtained when a flat closed top is fitted. Where the prevalence of insect pests, dusts, or falling leaves, etc., renders a top necessary, the life of the tank will be lengthened by the use of a conical shaped top with a mosquito proof ventilator at the apex.

A brass ¾-inch low pressure or range tap will be required. The ¾-inch socket is now inserted about a quarter of its length in the hole already made, and soldered firmly in position. The socket is supported by a boss (*see* Fig. 18) which is easily made from a piece of plain galvanized iron, 9 inches x 4 inches; cut a hole 1¼ inches diameter, and then shape as shown in Fig. 19, by bending along the dotted lines. The boss will then have a rough resemblance to a funnel, the small end being made to fit tightly around the end of the socket, and the other end trimmed to the contour of the tank (*see* Fig. 17). Then solder the boss securely to the tank, also along the joint, and around the socket.

There remains now only the soldering to complete the tank. For this a fairly heavy soldering iron, weighing not less than 2 lb., should be used. All rivet heads and seams on the outside of the tank must be carefully soldered, extra care being taken with the bottom. Finally the tap may be screwed into place.

About 4 lb. of solder will be required for the above tank, and 4 lb. of rivets and washers. The rivets used are the ordinary

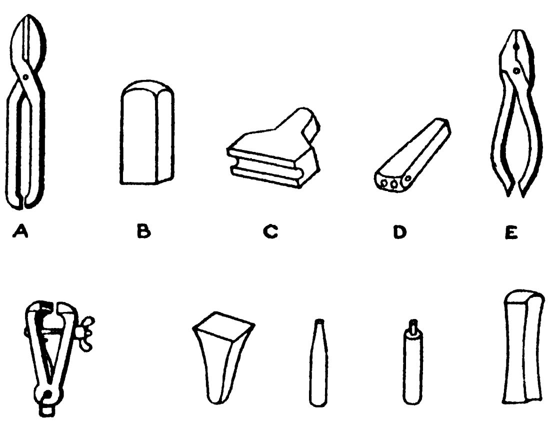


Fig. 21.

galvanized tank rivets with round heads, and they are usually sold with the washers.

Fig. 21 shows the tools required. A riveting hammer and a 2-lb. soldering iron will also be necessary.

The foregoing details can be applied in constructing tanks of all capacities.

When building tanks of more than 4 feet high, the vertical seam on the third cylinder should be over that of the first cylinder (*see* Fig. 22).

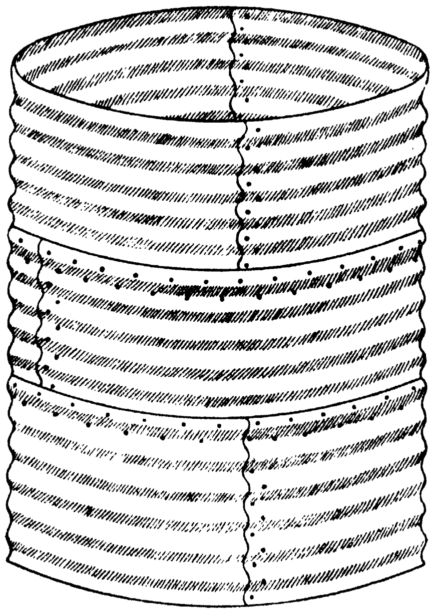


Fig. 22.

Tanks of 800 gallons and upwards should have a lap of two corrugations around the body, and a double ring of rivets (*see* Fig. 22).

The practice of tarring galvanized tanks and troughing should be regarded with suspicion. Some tars contain acids which promote the rusting of galvanized iron, and unless local experience has definitely shown the particular tar available to be strongly protective, it should not be used.

The Materials Required.

The following is a description of the materials necessary in the making of tanks up to 1,000 gallons.

The 200-gallon tank has already been dealt with.

400 GALLONS: SIZE, 3 FEET 9 INCHES DIAMETER × 6 FEET HIGH.

6 sheets galvanized corrugated iron 6 feet × 24 gauge, each curved to half a circle.

1 sheet galvanized plain iron 6 feet × 3 feet × 24 gauge.

1 sheet galvanized plain iron 6 feet × 3 feet × 26 gauge.

About 6 lb. solder, 6 lb. rivets and washers.

600 GALLONS: SIZE, 4 FEET 4 INCHES DIAMETER, × 6 FEET HIGH.

6 sheets galvanized corrugated iron 7 feet × 24 gauge, each curved to half a circle.

2 sheets galvanised plain iron 6 feet × 2 feet × 24 gauge.

2 sheets galvanized plain iron 6 feet × 2 feet × 26 gauge.

6 lb. solder, 6 lb. rivets and washers.

800 GALLONS: SIZE 5 FEET 3 INCHES DIAMETER × 6 FEET HIGH.

3 sheets galvanized corrugated iron 8 feet × 24 gauge, each curved to half a circle.

3 sheets galvanized corrugated iron 9 feet × 24 gauge, each curved to half a circle.

Note.—Join one 8 feet sheet and one 9 feet to form a circle.

1 sheet galvanized plain iron 6 feet × 2 ft. 6 in. × 24 gauge.

1 sheet galvanized plain iron 6 feet × 3 feet × 24 gauge.

1 sheet galvanized plain iron 6 feet × 2 ft. 6 in. × 26 gauge.

1 sheet galvanized plain iron 6 feet × 3 feet × 26 gauge.

7 lb. solder, 7 lb. rivets and washers.

1,000 GALLONS: SIZE 6 FEET DIAMETER × 6 FEET HIGH.

3 sheets galvanized corrugated iron 9 feet × 24 gauge each curved to half a circle.

3 sheets galvanized corrugated iron 10 feet × 24 gauge each curved to half a circle.

Note.—Join one 9 feet sheet and one 10 feet to form a circle.

2 sheets galvanized plain iron 6 feet × 3 feet × 24 gauge.

2 sheets galvanized plain iron 6 feet × 3 feet × 26 gauge.

For each tank a ¾-inch tap and socket will be required. If a quick delivery is desired in the larger tanks a 1-inch tap and socket could be fitted.

A Few Hints on Soldering.

The materials necessary for soldering work are the soldering iron before mentioned, a quantity of solder consisting of equal parts tin and lead, a bottle of muriatic acid (spirits of salts), and a small block of sal ammoniac. A handy container for the fire in which to heat the irons can be

made out of an empty benzine tin or oil drum, by cutting out the top, punching a few holes in the bottom and cuting a hole in the side within an inch or so of the bottom, so that the heads of the irons can be passed through into the fire.

To prepare to solder, pour into a bowl (glass or ware—not tin or galvanized iron) a quantity of the spirits and add a few pieces of zinc to "kill" the liquid. The soldering iron is first heated to a dull red heat, a fair portion of the point is filed cleaned, and this portion (while the iron is still hot) is rubbed with the sal ammoniac. The clean point is then tinned, that is coated with solder, and this is of great importance if good work is to be performed later. To tin the iron, run a little solder on to a piece of clean tin, alternately turning its point in the melted solder and dipping it in the killed spirits.

Before using the soldering iron, clean the joint to be soldered, and with the aid of a brush put on a little of the killed spirits The iron should be hot enough to make the solder run freely, but do not let it get red-hot. Withdraw it from the fire, brush the point with a piece of bagging, and dip it in the prepared spirits; then place the point of the iron on the joint to be soldered and move it slowly along, supplying solder as required by placing the end of the solder stick against the iron near the point. When soldering a loose patch, it will be found convenient to run a drop of solder on to the joint first, then hold the patch firm with the aid of the solder stick while the iron is operated to make the patch firm.The edges of any joints to be soldered should be fitted neatly and closely together, and the solder should run freely and adhere almost as if it were part of the tin.

Need for Mineral Fertilisers.

No Evidence of Harm from their Judicious Use.

THE following statement on a lately much debated question is taken from a recent issue of *Soil Conservation*, official organ of the Soil Conservation Service of the United States Department of Agriculture:

"Dr. Emil Truog, professor of soils at the University of Wisconsin, evaluated the importance of organic matter in the soil at the Fifth Annual Conference on Conservation, Nutrition, and Health, at Ohio University, recently. Dr. Truog said :

'Much ado is being made to-day about the great importance of soil organic matter in relation to soil fertility, soil conservation, and crops of satisfactory nutritive value. This, in part, is as it should be, because soil organic matter is of tremendous importance. It facilitates the intake of water and thus reduces run-off and erosion. It also favours workability or ease of cultivation, aeration, and drainage. Fresh organic matter contains all of the elements needed for plant growth, which, as decomposition proceeds, are released in forms suitable for new plant growth.

'However, to say that chemical fertilisers such as superphosphate and muriate of potash should not be used to make up inevitable deficiences of nutrient elements that cannot be supplied through the use of organic matter is just pure "bunkum." Absolutely no evidence exists to the effect that the judicious use of mineral fertilisers is at all injurious to soils, or tends to produce crops which are unsatisfactory as feed for animals or food for man. In fact, evidence, almost without end, now exists showing clearly that the use of mineral fertilisers on depleted soils promotes the growth of crops which have superior nutritive values.

'The fertility and organic matter content of gardens and other small areas may be maintained through the use of animal manure and composts. This use of composts is both feasible and commendable. However, when large areas are involved, as is the case in general farming, this practice is not feasible because of the impossibility of preparing and applying the enormous amounts of compost which would be needed. Fortunately, in general farming it is both convenient and profitable to follow a rotation of crops which provides the necessary organic matter in the form of crop residues (stubble, stalks, and roots) and animal manure produced in the feeding of crops. All that is required to make this system supply the needed organic matter is the proper use of lime, phosphate, and potash.

'It is sometimes said that "nitrogen spells organic matter." This means that liberal supplies of nitrogen promote such luxuriant growth that large additions of organic matter naturally follow. In the atmosphere over every acre of land, there exist in round numbers 35,000 tons of gaseous nitrogen. If these 35,000 tons of nitrogen were all transformed to a fixed (non-gaseous) form such as ammonium nitrate, the product would have a commercial value as fertiliser of over 5,000,000 dollars. How can the farmer draw upon this tremendous and inexhaustible supply of nitrogen? It is by growing legumes, which, when properly inoculated and fertilised, have the power of fixing atmospheric nitrogen which they can then use for the synthesis of proteins. Non-legumes, regardless of how grown, cannot utilise atmospheric nitrogen. They are dependent for nitrogen on that fixed by the legumes, or supplies in manure and commercial fertilisers.' "

THE MAKING OF SILAGE.

A Succulent Conserved Fodder

Suitable for Drought Feeding.

(*Continued from page* 130.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

IN the first instalment of this article (March issue), the uses of silage were set out, and the processes involved in silage-making were described.

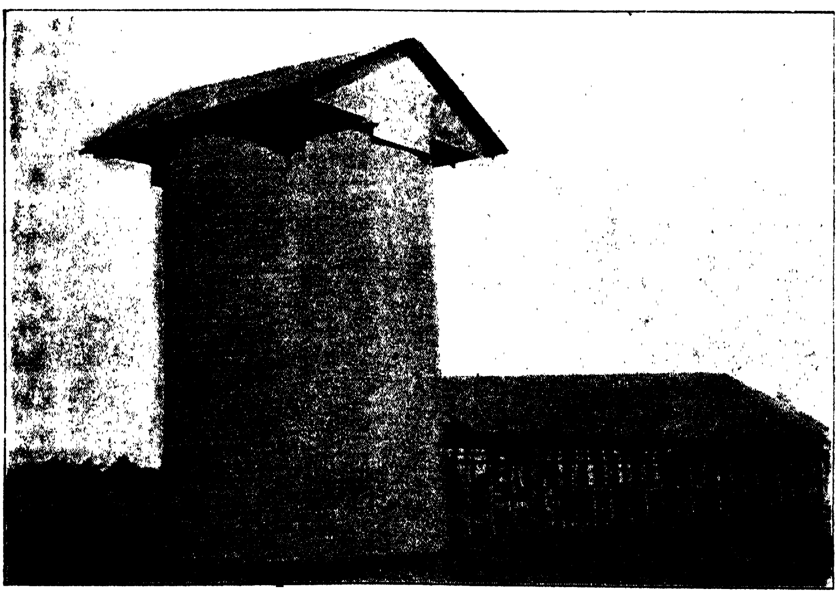
The theory of the ensilage process has been set out in some detail so that the farmer may understand the reasons for certain practices advocated during the actual work of making silage. For example, the cutting of material at the right stage while still containing plenty of sap, close packing, and thorough tramping, assist in rapid exclusion of air, and this reduces the loss of food material and digestibility by excessive heat production. Sappiness, and where necessary the addition of moisture or sugar solutions, assist in rapid and adequate acid production. Again the use of silos with smooth walls, and thorough tramping, assist even settling and the exclusion of air. Where the settling of the mass is impeded by rough silo walls, air pockets may occur which allow of mould growth. If pit or trench silos are dug in clay, the silo walls are subject to cracking in dry periods, and air may also gain entrance in this way.

Types of Silo.

In a discussion of silage-making practices in this State the different conditions of manufacture and use in coastal and inland districts require separate consideration.

On the coast, or under irrigation, the heavier yielding crops such as maize, sorghum and millet, are used extensively for silage-making, and barley and oats are also used. Pit, trench, tower and stack silos are all used, each for its particular purpose. The product is usually fed to dairy cattle.

Under inland conditions, however, barley, wheat and oats are mainly used, although in summer rainfall districts Japanese millet, which is probably best preserved in this way, may also be used. The trench silo



Silos at Old Bonalbo, Showing Location of Elevator House and Feed Stalls.

is generally the only one used in inland areas except for an occasional tower silo on dairy farms.

On the coast, silage is, or should be, made annually as a supplementary feed for routine feeding for production purposes, to be fed to milking cows during the winter and early spring months when natural pasture is coarse, sparse and dry. Long term reserves for dry seasons should also, ideally, be laid by. The tower silo, with a capacity of 60-80 tons of silage, is the ideal type for regular feeding on the dairy farm, because of the convenient handling facilities. For drought reserves the trench silo stands out as a cheap and efficient method of preservation. Both silage and hay (lucerne) are necessary in the feeding programme, but silage-making is an essential on the dairy farm.

In inland areas, however, silage is principally a drought reserve, and competes with hay, which has several advantages as an all round foodstuff. Each has its place, of course.

The Cost of Silos.

Tub or tower silos, the greater part of which is above ground level, are constructed most commonly in this country, of concrete. These are permanent installations, and cost upwards of £1 per ton capacity to build. The round pit silo consists of a circular hole excavated in the earth, frequently with a ring of concrete at ground level to prevent earth falling into it. These are not nearly as expensive as overhead silos, the cost depending largely on the type of soil in which the excavation is made. Silage preserved in them is of satisfactory quality, and they provide quite a good method for the dairy farmer to commence this form of conservation without extensive capital outlay. Once the farmer becomes convinced of the advantage of feeding silage, they can either be lined to make a permanent installation, with a roof over them if necessary, or incorporated into the base of a tower silo.

Trench silos might be classed as a semi-permanent installation, and the original cost of excavation should not exceed 4s. per ton capacity. They form the ideal silo for laying down drought reserves and can be used universally, both on the coast and inland.

The third form of silo is the stack, on which the capital outlay need be very low. It is, of course, not a permanent structure.

The Tower Silo.

The tower silo is the most expensive, but also the most convenient and long lasting. It is easy to fill and empty, and can be filled several times during a year if necessary. These silos are mainly used on dairy farms, and are ideal under these conditions. For Australian conditions the monolithic reinforced concrete silo (cast in one piece) is most popular and is undoubtedly the best.

The actual construction of these silos is not a difficult task. A separate publication describing the work in detail is available from the Division of Information, Department of Agriculture, Box 36A, G.P.O., Sydney.

Making Tower Silage.

The crop should be cut and carted to the silo in a succulent condition; it should not be allowed to dry out. Drays, slides or trolleys are used for carting-in; the accompanying illustration gives details of a handy trolley for the purpose.

With this type of silage it is essential that the greenstuff be chaffed before it is put into the silo, to allow proper tramping and exclusion of air.

The fodder should be chaffed into ⅜ or ½ inch lengths. The knives should be kept sharp and the chaff-cutter should be in good adjustment to reduce the load on the engine, motor or tractor, and allow clean cutting of the flag and leaf as well as the stalks and heads.

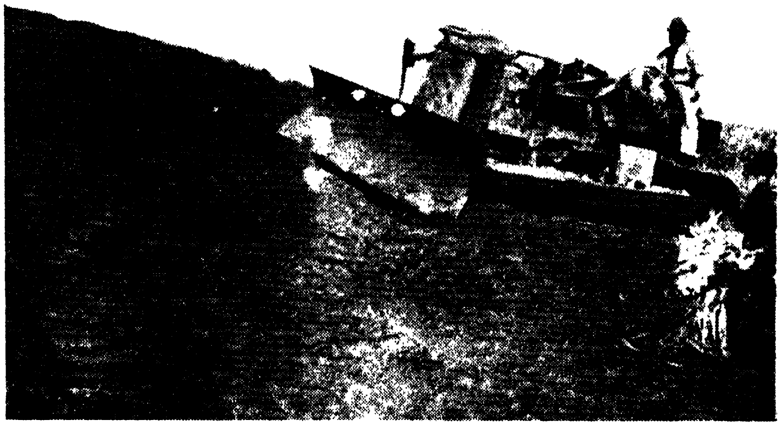
With sheaf material the bands should be cut and not allowed to go through the cutter. Loose material can be forked straight on to the table.

The chaffed material is carried on to the top of the silo by an elevator or blower, and falls to the bottom. A chain elevator is quite satisfactory for raising silage to a height of about 30 feet, which is the usual height above ground level of the type of tower silo recommended. Blowers will raise chaffed greenstuff to a greater height, and some American models are also fitted with a special pump feed for the addition of molasses or other curing solutions.

A man or boys should be at work continually in the silo, spreading the crop in 6

to 9 inch layers evenly over the whole surface, and tramping down, especial care being taken around the edges. The reason for tramping is, of course, the exclusion of air and the prevention of moulding and undue heating. If care is not taken around the edges, the material settles very hard in the centre, and later, as compaction goes on, pulls away from the edges allowing air to infiltrate.

When a doorway is reached, the boards should be placed in position against the wall and temporarily held in place by throwing the chaffed material against them. Frequently tarred paper, which can be purchased commercially, is used on the inside of the door to provide an effective air seal. However, with reasonably well fitting boards, this precaution can frequently be dispensed with. The fodder should be tramped particularly well in the immediate vicinity of and above the door to ensure that air is excluded.



Bulldozer being used for Pit Sinking.

A Trench Type Pit Silo Ready for Filling.

The smooth surface on the inside of the silo and its cylindrical shape, both assist even settling across the whole width.

When the top of the silo is reached, settling may be allowed to go on for four or five days, by which time the surface will have sunk between three and five feet below the top of the silo. It should then be topped off with further greenstuff. After further settling for a similar time it will probably

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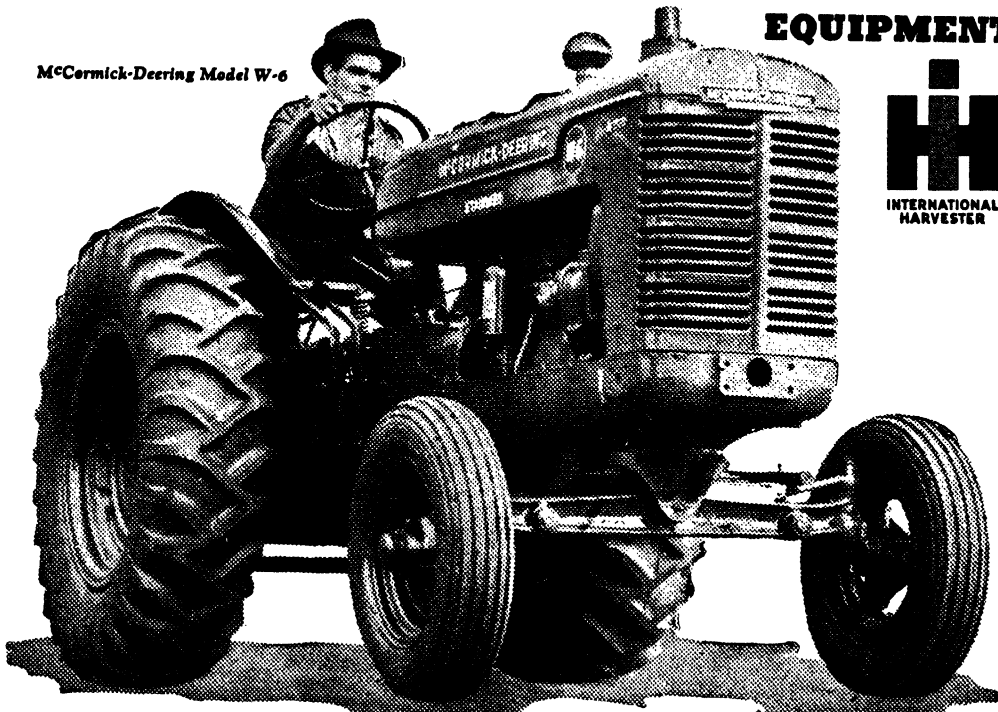

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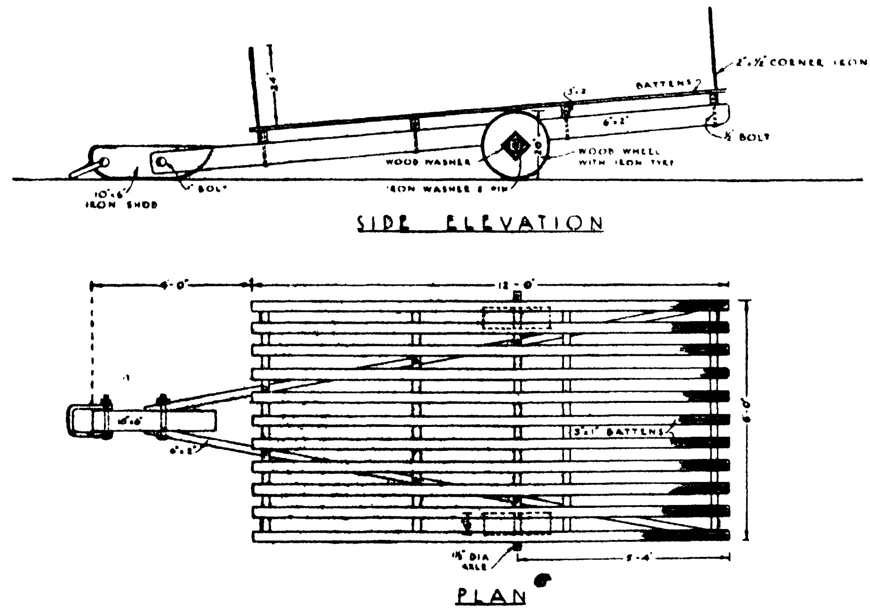
sink to the same extent again and may be refilled. When it is judged that settling is almost complete, poor material or "cocky" chaff (wetted) may be added to a depth of 18 inches to 2 feet. A few bags of soil or sleepers as weights may be added if desired, and will assist compaction, and (to some extent) reduce mould growth in the surface layers. When opening up the silo this top, mouldy layer is rejected and is not fed to stock.

Trench Silage.

The making of trench silage is a very satisfactory method of conserving this fodder for drought reserves, when it is to be kept for periods of a year or more. Next to stacking, ensiling in trenches requires the least capital outlay, and as the trench can be used on several occasions the cost of the silo in making trench silage would average out at about 1s. per ton for each filling. Once built in a suitable situation trenches are long lasting, and although not quite as satisfactory as tower silos, their use is an excellent way of becoming familiar with the making and feeding of silage.



Sketch showing Details of Construction of Trolley for Carting Fodder for Ensilage.

Selecting the Site for the Pit.

For preference a high spot, where there is no danger of seepage or of underground water lying, should be selected. Such a site can be found on nearly every farm. Avoid the heads of gullies and other depressions. The top of a ridge or spur is a particularly good site, especially if drainage can be obtained from the pit at one end. Good drainage (so that water will not run into the pit) is the main consideration. If this is available pits may be successfully constructed on flat country, but care should be exercised that the site is not susceptible to flooding.

In inland districts any red soil will be suitable. In general, clay soils are to be avoided as they tend to crack and allow the entrance of air at the sides of the silo.

When sheep are to be fed from the pit, it is an advantage to have it as close as practicable to the crop, to reduce the expense of cutting and carrying, but on the dairy farm a position in proximity to the bails has more to commend it, as ease of feeding is an important consideration.

Size of Trench.

The present tendency is towards the making of small pits of 35 to 40 tons capacity. Extra capacity is obtained preferably by lengthening the pit rather than making it wider or deeper. This facilitates filling and covering, and there is less shrinkage. In addition, cutting on the small face exposed in a long pit leaves less material exposed to the air. This is an advantage if a trench is opened, but not completely emptied, at any time.

A pit to hold 35 tons should be 50 feet long at the top, 20 feet long at the bottom

and 5 to 6 feet deep. It should taper from 9 feet wide at the top to 8 feet wide at the bottom.

A trench 80 feet long by 14 feet wide, 4 feet deep, holds 70 tons. It is generally better, however, to have two small trenches rather than one big one, as filling and feeding out are facilitated.

The walls are finished smooth and with a slight batter, to allow free settling and ensure a constant downward pressure of the silage on the walls. By this means efficient exclusion of air, and mould growth along the walls is prevented.

An effective type of pit can be made on the side of a slope with a gradient of about 1 in 10, the end of the trench on the up-side of the slope being given a batter of 1 in 3. The other end is allowed to run out to ground level on the down-side of the slope, this permitting of effective drainage and ease of filling.

The smallest satisfactory size of pit is about 20 tons capacity, while the largest should not exceed 70 tons. In excavating, it is safe to estimate the silage capacity of a pit, as at the rate of one ton of silage for each 2 cubic yards excavated below ground level. A good crop of wheat or oats will cut between 4 and 5 tons of silage to the acre, while on the coast Japanese millet will cut about 8 to 10 tons, and maize between 12 and 25 tons to the acre. Usually the yield of silage from a maize crop would lie between 15 and 20 tons, and the yield from Saccaline sorghum is generally a little lighter.

Two men with a team of three good horses, a strong but light, single-furrow plough and a light half-yard scoop, can put down a 70-ton pit in less than two weeks. The work can be done in slack periods. The cost should not exceed 2s. per yard (that is 4s. per ton capacity) even where done by contract. The pit will last for years and can be filled more than once. The sides and bottom of the pit should be smoothed off with a mattock or pick to allow even settling and ease of emptying.

Filling the Trench Type of Pit Silo.

When only 40 to 70 tons are to be cut, three men with one waggon can easily carry out the work. When greater quantities are to be handled five or six men are required for the filling operation—four men with two waggons for carting, a man in the pit, and a man to operate the binder. This latter can assist with the loading of the waggons when enough has been cut for the day.

If the crop is cut with the mower, it is better to fork the loads off rather than pull them off with a rope, as is sometimes advocated, as more thorough packing can be obtained in this way.

The crop should be packed as close and tight as possible, all the sheaves being laid in the one direction. Barley, wheat and oats are laid crosswise to assist packing. While maize and Saccaline may be chaffed into the pit with advantage, if stacked long they should be placed in rows lengthwise through the pit. The first row should be placed with all the heads lying in one direction, and the second row should be similarly placed but with the heads pointing in the opposite direction, the sheaves lapping the preceding row by half a length. The stacking is continued in this fashion through-

Chaffed Maize Heaped up Prior to the Covering of a Trench Silo.

out. The centre should be kept a little higher than the outsides, and the bands are never cut. Pack the bundles closely, particularly along the sides.

Once the first few loads have been added, the drays should be run through the pit over the crop already in it. It is an advantage to cart in alternate loads from opposite ends, thus adding material to both sides of the heap.

Where motor transport or slides are used, it is not possible to drive through the pit. In this case the spoil from the excavation should be dumped at a distance from the edge on one side of the pit, to allow the truck or slide to be drawn up close to it and assist filling. In this case a roller, tractor or some other heavy implement should be run through the pit to compact the crop. Rapid, even, compaction is important to bring about air exclusion and assist fermentation.

When ground level is reached, the material should be built out about 4 inches beyond the edge of the pit. This overlap will draw in when the crop settles and tend to keep it close up against the walls of the pit and prevent the entry of air.

Completing the Filling.

When the pit has been filled slightly above ground level, it should be left for a few days and will commence to settle. The total subsidence will be between a quarter and one-third of the final total depth. If two pits are being filled, work may cease on one pit for a few days to allow settling, and filling of the other silo proceeded with. Alternatively a couple of layers may be added every second day.

Settling will go on for about a week and should by then be almost complete. The crop should then be piled up above the ground to a level equal to the depth of the pit, as the settling of this material will be considerable. At the ends, the stacking above ground should taper off to conform to the batter of the pit.

Working this way—allowing periods of settling and spreading the work over a fortnight—the pit is generally so compact that when covered it will not settle below ground level.

Even when allowing for plenty of settling and leaving a stack about four feet high, the material will sink down after a few months until only a slight mound is left. It is important that the pit be well filled, otherwise after a few weeks the site of the pit will be marked by a depression, which means that not only is some of the storage capacity not utilised, but water can run into the pit and damage the contents. It must be remembered that even when pressed in as tightly as possible during filling, the material is, comparatively speaking, loosely packed. The heat generated softens the stems, and the weight of the greenstuff above and the covering of earth, press it together until finally it becomes almost as solid as a plug of tobacco.

Rain on the material while it is being made into silage does not in any way damage it. If the material is rather too dry, rain may improve it. Many farmers add water to such material to ensure that good silage will be made, but there is a risk attached to this practice. It is better to cut the crop when young and sappy, as dry material may be deficient in sugar for fermentation, and the addition of water may cause mouldiness. Two or three additions of between ½ and 1 gallon of water per square foot of surface may be safely added to a crop which is on the dry side as filling goes on, but when additions of water are made, it is better to add a solution of molasses (containing 1 or 2 lb. of molasses in 10 gallons of water) spreading evenly with a watering can, as a protective against mould growth.

Covering the Pit.

After the final filling it is advisable to allow the material to settle for a couple of days, as this reduces the height and renders covering easier. If the rate of settling is very slow, it may be taken for granted that the pit has been well filled.

The work of covering is done with a scoop, the earth being scooped straight on top of the greenstuff. As the top couple of inches is discarded when opening, some farmers place a layer of green grass over the top of the pit before adding the soil. A depth of 12 to 18 inches of soil is sufficient to provide weight to compact the surface layers, and exclude rain. Any greater quantity serves no useful purpose and increases the cost of covering and removing the soil later.

If at any time a depression is seen over the top of the pit, in which water might

lie, it should be filled with earth so that the pit will still shed water. Seed of a quick growing cereal like oats, wheat or rye is sometimes scattered on the surface covering to assist in holding the soil together and prevent washing in districts where heavy rainfall is experienced. Surface drains should be made at each side to prevent rain water running towards the trench.

Opening the Pit.

The surface soil covering is removed (with a scoop) to a point a little back from the face to which the silage is to be cut. If any earth happens to get mixed with the silage, it is shaken out when the fodder is being thrown to the stock. The silage will sometimes be found to have a coating of two or three inches of rotten material which should not be fed to stock, as it may have harmful results. The pit is usually opened up a section at a time, and usually very little waste is experienced, only a few straws being left lying on the bottom of the pit after emptying.

The Cylindrical Pit Silo.

This type of silo is similar to a tower silo in shape and in the quality of silage produced, but is constructed underground. Provided the soil type is suited to a deep excavation, the pit need not be completely lined with concrete, and in this case construction is cheaper than in the case of a tower silo. In addition, no elevator or blower is required to convey the chaffed greenstuff into the silo, and the addition of effective weights to compact the top layers is facilitated. Further, as there is ample head room above them, which is not the case generally with a tower silo, more material can be placed in them and tramped, thus utilising their full storage capacity.

Usually they are 14 feet in internal diameter and the depth may be up to 28 feet. They may be completely lined with a 4-inch concrete wall and concrete floor. Alternatively, a ring of concrete 4-inches thick may be built around the top to prevent damage to the walls at the surface and also the possibility of water running into the pit. The fully lined type is to be preferred. Advice on its construction can be obtained by writing to the Chief, Division of Information, Department of Agriculture, Box 36A, G.P.O., Sydney.

The cost of sinking may be up to £1 per foot, but the farmer is able to do most of the work himself in slack periods if necessary. Each foot of depth of a silo 14 feet in diameter would hold about three tons of silage. If only a collar is constructed, it should be 5 feet 6 inches high with 3 feet below the ground and 2 feet 6 inches above the ground.

A shed should be built above the silo, and a hoist and skip installed to remove the earth and, later, the silage from the silo. A handy idea in using this type of silo is to make wire netting baskets (for example, from rabbit netting) each to hold the ration for a single cow. Half a dozen or a dozen of these may be loaded on to a platform and hauled to the top in one load.

The fodder should always be chaffed into the silo, and the operations are almost identical with those described for the making of tower silage.

Where there is no danger from seepage water, the unlined silo is perfectly satisfactory. The fully lined pit silo costs about the same amount as a tower silo of similar capacity, and for those who do not wish to undertake the construction of the tower type, the underground pit can be recommended. They are slightly more troublesome to empty than is the tower silo.

(*To be continued.*)

Results of Potato Marketing Board Election.

THE poll for the election of five producers' representatives to the Potato Marketing Board, which was conducted on 12th March, resulted as follows, announces Dr. H. J. Hynes, Chief of the Division of Marketing and Agricultural Economics of the Department of Agriculture and returning officer for the poll:

No. 1 District (North Coast): J. D. Kirby.

No. 2 District (Hunter River, Metropolitan and South Coast): H. A. Swane (elected unopposed).

No. 3 District (Northern Tableland and North-western Slopes): H. Starr.

No. 4 District (Central Tableland and Central-western Slopes): I. C. Hood (elected unopposed).

No. 5 District (Southern Tableland and South-western Slopes): W. J. Lowe.

FRUITGROWING.

THE PREPARATION OF LAND FOR PLANTING FRUIT TREES.

J. A. HOLBECHE, H.D.A., Fruit Instructor.

THE preparation of the land for planting fruit trees is the first and one of the most important steps towards the successful establishment of an orchard.

It is important that the preparation work be commenced well before planting time, otherwise it will most likely receive only hurried and faulty attention.

New Clearing Methods.

Where the selected orchard site is timbered the clearing of the land will be the first consideration. New methods of clearing land with bull-dozers and rippers have done away with a great deal of the hard labour and time required to prepare heavily timbered areas for planting. However, attention is drawn to the importance of making a thorough job of the clearing—an extra ripping to bring up all roots is well worth while, particularly when the Armillaria fungus is known to exist.

The importance of removing all roots during the clearing operations was referred to in an article entitled "New Methods and an Old Menace" published in the July, 1946, issue of the *Agricultural Gazette*. In areas where Armillaria is prevalent, newly cleared land should, if possible, be sown down for several years to a field crop which is not susceptible to the disease, before planting with trees.

Fencing and Grading.

The construction of a good rabbit-proof fence, so that the orchard area will be protected against these pests, should receive attention well before any trees are planted. Much expense and care has been wasted when trees not adequately protected have been eaten out and killed by rabbits.

The grading of the land before planting is all important on irrigated areas.

Subsoiling.

The land should be ploughed and subsoiled prior to planting. The only time the subsoiling may not be necessary is when the subsoil is very friable or the land has already been deeply ripped and thoroughly cleared of roots by the bull-dozer. The subsoil will, of course, sooner or later settle down to its original state; but even if it is only for the first season, the trees have the benefit, their roots being given a better chance of becoming well established. Another advantage of subsoiling is that it finds roots that have been missed when the land was grubbed. This is of special advantage in country infected with Armillaria.

It is best to subsoil the whole area which has been selected for the trees, rather than to do only a strip along the line to be planted.

It is best to carry out subsoiling some months before planting, and leave the land in a rough state; it then has a chance of absorbing any rains that may fall, and planting can be carried out just when desired. Fifteen inches is a good depth to aim at when subsoiling, but in most land there are places where the subsoiler will rise to 12 inches, bogging in to over 18 inches in other places.

Just before planting, the land should be deeply ploughed, followed by a deep cultivation that will bring any clods to the top. Although the harrow is not considered a desirable orchard implement to use after planting, a harrowing before planting facilitates laying out operations.

Methods of Planting.

On very slight slopes or levels where there is no fear of washaways the orchard can be laid out on a regular system of straight lines. Some orchardists prefer the square and others the hexagonal or equilateral triangle method. With the latter system the trees are more evenly spaced. Where orchards are being planted on areas or soils

likely to erode, the contour method of planting is recommended.

The Problem of Soil Erosion.

The greater portion of the pome fruits produced in New South Wales is grown on the tablelands or slopes, and unfortunately, as a result of the intensive cultivation required in order to keep the trees healthy and bearing annual crops of quality fruit, the soil erosion problem is one in which the majority of the pome fruit growers are intensely interested.

In the planting of new orchard areas the mistake is frequently made of concluding that because the area in question has not shown signs of washing in the past it will not do so in the future. Areas which have previously been under pastures, and even ground which has been cropped with cereals, etc., for many years and has shown no signs of washing may, when planted with fruit trees and continually cultivated, quickly show small washes, especially in cut-outs made by the ploughs, wheel tracks, etc. These miniature washes, which at first are hardly noticeable, will increase in depth and width unless they are attended to, until, as is to be found in many of our older hillside orchards, they quickly develop into gullies and creeks, and are a constant menace. The orchard gradually becomes washed out and valueless when, in reality, it should be in its prime.

No system of contour banking on old orchards, or contour planting of young orchards, will prevent soil erosion altogether. All hillside orchards must wash to a more or less extent; but by a proper laying out of orchards or vineyards on the contour system all serious soil erosion can definitely be eliminated, and the gradual sheet erosion, which must necessarily take place, be reduced to a minimum.

APPLE GROWING IN NEW SOUTH WALES.

(*Continued from page* 151.)

H. BROADFOOT, Chief Fruit Instructor, and E. C. WHITTAKER, Fruit Instructor.

THIS is the eighth instalment of this article, which commenced in the August, 1946, number.

In the issues since then the authors have dealt with districts, soils, sites, planting, varieties, stocks, soil management, harvesting, pruning, reworking, pest and disease control.

In the current issue they discuss plant nutrition, cold storage and the cost of establishment of an apple orchard.

Plant Nutrients.

In its virgin state most of the soil in our main apple producing centres is well supplied with adequate amounts of the various plant nutrients needed to promote healthy and vigorous tree growth. This happy state of affairs cannot continue indefinitely, however, unless the leaching effects of time, continuous cropping and cultivation can be countered by sound soil management practices.

Excessive tillage and erosion are the two main evils to guard against, for when the top soil is washed away the major portion of the readily available plant food goes with it, leaving the remaining soil in an impoverished condition, resulting in prematurely aged and "staggy" trees and poor, or at least alternate crops.

There is an accumulating weight of evidence to prove that a high standard of tree health and regularity of cropping are dependent on sound soil management practices—particularly winter cover cropping, rational methods of cultivation and control of soil erosion. No programme of manuring with artificial fertilizers can compensate for the continuing loss of top soil and organic matter, and much money can be wasted on such fertilizers if a knowledge of the fundamental principles of tree nutrition is lacking.

Before embarking on any manurial programme, it is essential to have some understanding of the requirements of the apple tree and the role which each nutrient plays

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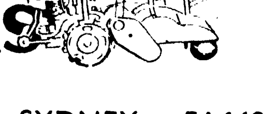

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DEPARTMENT OF AGRICULTURE, N.S.W.

PASSION-FRUIT CULTURE ON THE NORTH COAST

(*Farmers' Bulletin No.* 169.)

by

H. W. EASTWOOD, H.D.A., Special Fruit Instructor.

The North Coast is eminently suited to the production of passion-fruit, and particularly of early crops. For the best results, however, it is essential that the producer should have a thorough knowledge of his business. Every aspect, from the selection of the site of the vineyard to the packing and marketing of the fruit, is dealt with in detail in this publication.

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in the tree's growth and well-being. To enable the grower to obtain a better grasp of this very important phase of apple culture the most important of these nutrients will be considered briefly.

Major Nutrients.

Nitrogen.—This is without doubt the most important single nutrient to be considered, as it is absolutely essential for the growth of normal plant life. Soil management practices of the "clean cultivation" type have tended to deplete the soil of the most important source of this vital plant food, viz., organic matter, and there is today much evidence of nitrogen deficiency amongst apple trees in this State. In the absence or shortage of organic matter in the soil, the application of artificial fertilizers containing nitrogen is unlikely to be effective in restoring tree health.

Symptoms of nitrogen deficiency are:—

(*a*) Small, light green to yellowish coloured leaves—the colouring being uniform and not mottled as shown by deficiencies of other elements.

(*b*) Reddish coloured bark.

(*c*) Weak, spindly growth.

(*d*) Early defoliation.

An excess of nitrogen is not so common, but is also undesirable. It is characterised by excessive vegetative growth, delayed maturity and poor colour in the fruit.

Potassium.—In some of the older apple-growing parts of the world potassium deficiency is quite prevalent, but to date there has been little evidence of trouble from this source throughout New South Wales. However, a deficiency of potassium can cause serious disorders, and as it is unlikely that our soils will continue indefinitely to supply all the potassium required, growers should be on the alert to detect signs of a deficiency developing and be in a position to distinguish between the symptoms of potassium deficiency and deficiencies of other nutrients.

Characteristic symptoms of potassium deficiency first appear as a brownish discoloration of the marginal area of the lower leaves of the current season's growth. Later, the discoloration extends further into the leaf area, becoming reddish brown in colour, whilst in the advanced stages the leaves become hard and brittle with ragged and broken margins having a distinctive ash-grey colour along the edges, merging into dark reddish brown in the body of the leaf.

Left.—Twig from Apple Tree suffering from Nitrogen Starvation.
Right.—Twig from Healthy Tree.

Fruit from trees suffering from a potash deficiency tend to be poorly coloured and low in sugar content.

Phosphorus.—A deficiency of this plant food is seldom if ever encountered under our conditions, and provided sound green manuring practices are carried out, including an annual autumn topdressing with superphosphate, there seems little likelihood that serious deficiencies of this substance should occur.

A lack of phosphorus shows itself mainly in:—

(*a*) A delayed bud break in the spring.

(*b*) Less leaf buds than usual and abnormally small leaves.

(*c*) Foliage at first dull green, but later taking on a bronzed appearance, except along the midrib and possibly the secondary veins.

Minor Nutrients.

In addition to the major elements, small or even minute quantities of some others are needed for healthy tree growth. These are known as "minor" or "trace" elements, the term referring to the quantity needed and not to the effect of a lack of it, which very often can be of major importance.

The two minor elements which are of most consequence to New South Wales growers are boron and zinc.

Boron.—In the case of applies, a deficiency of boron is usually first manifested as the well known conditions known as Internal Cork, Corky Core and Superficial Cork.

Affected fruit is frequently malformed, and cork-like tissue is found scattered throughout the flesh.

Soil applications, during the early part of the growing season, of borax (which contains an appreciable amount of boron) have been proved to be entirely efficacious in preventing losses from "corky" fruit. The dosage should be based on the age and size of the trees.

Zinc.—This is another minor element necessary for the healthy growth of all plants.

The characteristic symptoms of zinc deficiency in the case of apples are:

(*a*) Very small and narrow leaves;

(*b*) Leaves generally paler and duller than normal foliage, and may become mottled, especially during the summer and autumn.

(*c*) The internodes of the terminal branchlets are short, giving the effect of rosettes of leaves.

(*d*) Die-back of the terminal shoots occurs in the more advanced stages.

Apple trees affected by zinc deficiency can be effectively restored to health in most cases by spraying during the dormant period with zinc sulphate, 50 lb. to 100 gallons of water.

Other Minor Nutrients.

Other minor elements of lesser importance are iron, magnesium and manganese. All these elements are associated with the development of chlorophyll or green colouring matter of the leaves, without which the leaf cannot function efficiently. In this State, however, little trouble has been experienced to date from deficiencies of these elements, but as time goes on it is possible that such deficiencies may occur, and then any chlorotic conditions of the foliage should be suspect as indications of a shortage of one or other of these elements.

Balanced Nutrition.

With all the major and minor elements present in the soil in the correct proportions, the maintenance of tree health and production of satisfactory crops should not, theoretically, be a difficult process, and it is thus reasonable to assume that apple trees which are healthy and vigorous and yielding constant crops of good quality fruit are growing in a soil in which the various plant nutrients are well balanced. Such a balance, however, can be, and often is, destroyed by faulty cultural practices which result in reducing the organic content of the soil with a resultant lowering of the nitrogen content, and an upsetting of the whole plant nutrient ratio.

Even in a well balanced soil, deficiencies of an element may be induced by the continuous use of another. The effect of continual applications of nitrogen, for instance, is to increase growth, up to a certain point, but the more the tree grows the greater its demand for other elements. If the supply of these other elements was, in the first place, just sufficient to keep the tree in good health at the original nitrogen level, then the increased demand due to the increased growth may very easily lead to a deficiency of one or more other elements. The application of fertilizers which are mixed, or as they are commonly termed "complete" as to the major elements, minimises the risk of ill-balanced manuring.

Any system of artificial fertilizing, however, should be regarded as merely supplementary to sound cultural practices.

The value of winter-growing cover crops has been already stressed in regard to the build-up of organic matter in the soil, but it should also be remembered that the remains of such plants, when incorporated with the surface soil, not only add organic matter when they decay, but are also storehouses of mineral plant food.

Probably the first and most important use for artificial manures in New South Wales orchards is the regular autumn application of fertilizers, particularly phosphates. This application is made to meet the requirements of the winter-growing cover crop, but the trees benefit indirectly later when the soil organisms have completed their work on the ploughed-in green crop.

In the past, the mistake has frequently been made of waiting until the trees show

obvious signs of decline before attempting to carry out any planned system of manuring. In such cases the process of re-building the depleted fertility of the soil is mostly a very slow and costly process. It is a far wiser policy and very much cheaper to keep a steady programme of soil fertility maintenance going practically from the inception of the orchard.

Cool Storage.

Without the aid of cool storage facilities, apple growing on the scale practised to-day would be impossible. Before the advent of cool stores a multitude of varieties was regarded as essential to spread the harvesting and marketing period as much as possible. To-day, with the aid of refrigeration, it is possible for the grower to specialise in a very limited number of the most popular varieties and yet be able to market his produce over a large portion of the year.

A grower in a district where cool storage facilities are not available is at a distinct disadvantage, in so far as he is compelled either to market his fruit as it matures, which is usually when the market is heavily supplied both with local and interstate fruit, or trust to his agent in Sydney to attend to the cool storage and marketing at that end. The latter may be quite all right up to a point, but nevertheless is seldom as satisfactory as the system of cool storage within the growing district.

Over the years, considerable research work has been applied to the storage of fruit under refrigeration, and at the present time such cool storage has reached a high degree of efficiency. The beginner in apple culture, however, should realise that not all apples grown are suitable for storage purposes. The period for which such fruit may be stored satisfactorily depends on many factors, such as the variety, size of fruit, weather conditions, stocks, soil, age and health of trees, picking maturity, disease and insect pest infestation, etc.—apart from other factors involved in the actual management of the cool store. It should be obvious then that the successful cool storage of apples is somewhat of a specialised business and the beginner would be well advised to seek advice before embarking on any large scale storage of this fruit.

Left.—Apple Branch suffering from Zinc Deficiency, showing Little Leaf and Rosette. *Right.*—Normal Shoot. [*After Ward.*

The Cost of Establishing an Apple Orchard.*

A statement of the costs of establishing an apple orchard can only be approximate, even if applied to a particular area in the State. However, the costs to a majority of

* REFERENCE: Report of Royal Commission of Enquiry into the Fruit Industry of N.S.W.

orchardists in a given area "of average efficiency, in usual conditions and normal circumstances" can serve as a guide to prospective growers.

The items which cost money such as, say, land, buildings, labour and spray materials, can be fairly accurately estimated, but the influence on costs of production of the individual factor, the grower himself are much less easily assessed. Success or failure in fruit growing depends largely upon this individual factor which includes in its make-up, health and strength, knowledge, experience, application, inclination, aptitude, initiative and business ability.

The table of costs which is given is that arrived at by Mr. McCulloch in his "Report of the Royal Commission of Enquiry into the Fruit Industry of New South Wales," made shortly before the present war, and is regarded as a close approximation at the time it was prepared.

Costs of labour and materials have risen considerably since that time, and there is a general trend towards larger individual orchards with greater mechanisation. This does not necessarily imply that a tractor and tractor implements must be included in establishment costs in place of horses and horse-drawn equipment, because it is possible that machinery pools may have a considerable influence in reducing the necessity for individual ownership of this machinery.

The provision of packing sheds, fruit graders and other fruit packing equipment on each orchard may not be required if the fruit crop is handled by central packing sheds as it is in some districts.

No allowance is shown in the table for water supply. It is believed that insufficient consideration has been given, in the past, to the urgent need for an adequate water supply. In some circumstances stabilised production is promoted by it, and in all circumstances it is essential to good living and the convenient working of an orchard.

TABLE OF COSTS OF ESTABLISHMENT OF AN APPLE ORCHARD AT BATLOW. 20 ACRES—75 TREES PER ACRE.

Item of Cost.	£	£
First Year—		
Land and clearing ...	315	
Fencing ...	60	
House ...	300	
Sheds ...	40	
Trees ...	72	
Casual labour ...	20	
Plant ...	60	
Horses ...	60	
Horse feed ...	39	
Harness ...	15	
Rates ...	1	
Incidentals ...	10	
		992
Interest, 6 months at 5 per cent. ...		24·8
Cost at end of One Year ...		1,016·8
Second Year—		
Replacement of missed trees ...	2·16	
Horse feed ...	39	
Rates ...	2	
Insurance—Fire ...	2	
Incidentals ...	10	
		55·16
Interest 6 months at 5 per cent. ...		1·38
Interest, 12 months at 5 per cent. ...		50·84
Cost at end of Second Year ...		1,124·18
Third Year—		
Horse feed ...	39	
Rates ...	2	
Insurance ...	2	
Incidentals ...	10	
		53
Interest, 6 months at 5 per cent. ...		1·32
Interest, 12 months at 5 per cent. ...		56·2
Cost at end of Third Year ...		1234·7
Fourth Year—		
Same annual cost as third year ...		53
Plus interest, 6 months at 5 per cent. ...		1·32
Interest, 12 months at 5 per cent. ...		61·73
Cost at end of Fourth Year ...		1350·75
Fifth Year—		
Same annual cost as fourth year ...		53
Plus interest, 6 months at 5 per cent. ...		1·32
Plus 12 months at 5 per cent. ...		67·53
Cost at end of Fifth Year ...		1472·60
Sixth Year—		
Same costs as fifth year ...	53	
Plus packing shed ...	100	
Spray materials ...	15	
Spray pump ...	140	
Grader ...	120	
		428
Interest, 6 months at 5 per cent. ...		10·7
Interest, 12 months at 5 per cent. ...		73·63
		1984·93
Less Income—		
37·5 bushels per acre at net price of 4/9·4 per bushel ...		179·37
Cost at end of Sixth Year ...		1805·56
Seventh Year—		
Same costs as fifth year ...	53	
Plus grower's maintenance ...	148	
Casual labour ...	100	
Insurance—Workers Compensation ...	1·5	
Spray materials ...	20	
		322·5
Interest, 6 months at 5 per cent. ...		8·06
Interest, 12 months at 5 per cent. ...		90·28
		2226·4
Less Income—		
75 bushels per acre at net price of 4/9·4 per bushel ...		405
Cost at end of Seventh Year ...		1821·4
AVERAGE COST PER ACRE ...		91

It will be noted that during the establishment period—except in the year when production has reached a substantial quantity no allowance has been debited in the table to establishment costs for the sustenance of the grower and his family.

Interest.—Interest has been allowed at the end of each year—at the rate of five per cent.—for a period of six months in respect of expenses incurred during the current year and for a period of twelve months in respect of the accrued capital debt at the commencement of the year. Interest and working expenses in each year have been added to the accrued capital debt.

Income from Wages and the Sale of Side Crops.

Many orchardists, in the past, have offset their establishment costs by wages from casual employment away from their own orchards. It is not humanly possible to forecast the future accurately, but preparation to meet observable trends in the industry can be justified. There appears to be some reason to expect that the average size of commercial apple orchards in the future will be larger than they have been in the past, and it is likely then, that the establishment of his orchard will demand the grower's undivided attention and will not allow him time to do casual work on other properties.

There are possibilities, though, in the sale of side crops. Highly intensive cropping with vegetables can cause direct competition with the young trees and a lowering of the fertility of the soil into which their roots are advancing.

A rotation which includes leguminous cash crops such as peas and beans, or a leguminous crop which is sown for the purpose of maintaining fertility, will, however, remove the orchard side-crop grower from the ranks of the all-out exploiters of virgin soil who foot the bill in later years in reduced tree growth and fruit crops. It is recognised that they may be compelled to exploit their soils, not from choice but from economic necessity.

Although the tendency to erode by storm water is less with virgin soils, this menace to fertility can be started on its destructive way when vegetable crops are grown amongst fruit trees, especially those vegetables which require a fine seed bed.

It pays to observe sound soil management practices throughout the establishment period.

(*Concluded.*)

Roller Vegetable Marrow Has Good Qualities.

The Roller vegetable marrow was introduced by the Department from Messrs. J. L. Clucas Limited, Ormskirk, Lancs., England, in 1941, and was first tested at Grafton Experiment Farm, where it created a very favourable impression. During the 1946-47 season, tests were carried out at Hawkesbury Agricultural College and in co-operation with private growers, and the results confirmed those obtained at Grafton.

Although the Roller marrow is later than either the White Brush or Green vegetable marrow, its quality is much superior. It possesses very thick and firm flesh, which enables it to be cooked without sloughing and in addition, when cooked, the flavour appears to be much superior to that of the varieties now grown.

The Roller marrow is a vining type producing heavy yields of large uniform fruits. Its late maturing habit, although a disadvantage, is not a very serious one because the variety may be used in conjunction with the early maturers so as to provide a longer harvesting season.—A. C. Orman, Special Agricultural Instructor.

Value of Systematic Thinning of Apple Crops.

The value of the systematic thinning of apple crops, particularly McIntosh Red, is being impressively demonstrated in the Oakdale district. In orchards where the crop has been properly thinned large trees of a good age can be seen carrying several bushels of excellent, uniform sized, marketable fruit.

Another point of importance in an early district is that the fruit reaches maturity earlier when thinned. Thinning also makes it easier to apply satisfactory cover sprays for the control of codling moth and hormone sprays for the prevention of pre-harvest drop.

The financial results that regularly accrue to growers who make systematic thinning a routine orchard operation should not be ignored by the grower who considers thinning his crop a "good idea if time is available."—Division of Horticulture.

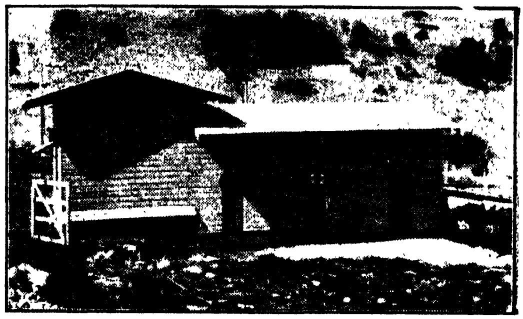
MODERN DAIRY FARM BUILDINGS

Provide for Good Hygiene, Efficient Feeding and Shelter for Stock and Dairymen.

I. W. SCOTT, H.D.A., H.D.D., Special Dairy Officer.

WHILE new dairy buildings of modern design will not, alone, guarantee the choicest quality of produce, it is undeniably easier to produce good quality products in good buildings—just as old dilapidated buildings make it hard to produce good quality produce because of the difficulty of keeping them clean.

THE OLD AND THE NEW.



Old dilapidated buildings, of the type illustrated on the left, with the manure heap too close to the milking bails and the general air of neglect, do not allow of hygenic methods in production. While there are still many buildings of this type in existence they are steadily decreasing.

The illustration on the right shows the type of modern dairy which is taking the place of old buildings. Plans and specifications of this type of building may be obtained from the Division of Dairying, Department of Agriculture, Sydney.

Feeding Stalls.

Nothing is more important in dairying than the adequate feeding of the cattle. In the Milk Zone, regular hand feeding of stock is a well established practice and hardly a farmer is to be found without a set of feeding stalls of some kind. In the butter areas where the remuneration per gallon is about half that of liquid milk, there is little margin for supplementary feeding, but many farmers with high producing stock find that limited hand feeding of grain and home-grown roughages can pay dividends. Evidence of this is to be seen in the number of feeding stalls erected and being erected in these areas.

Feeding Stalls on a Middle Rivers Farm.

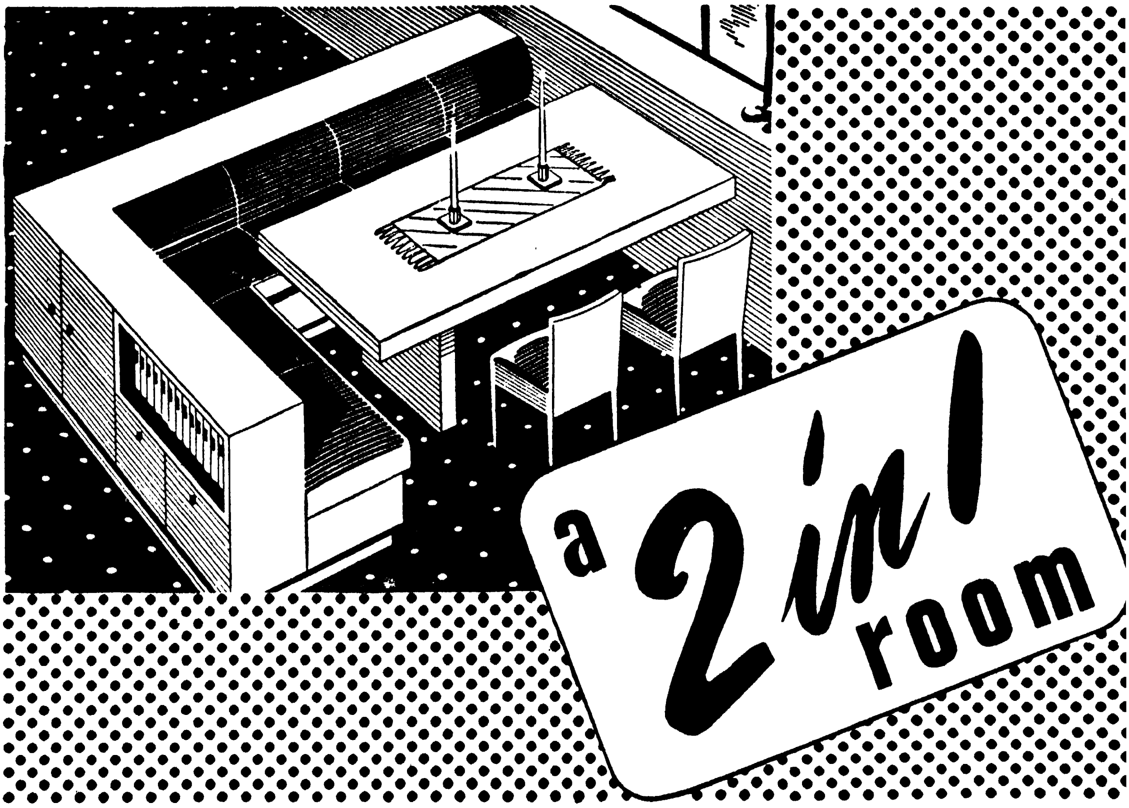
One Middle Rivers farmer, has recently constructed the feeding stalls and shed shown in the accompanying illustration. This is more elaborate in design than the average farmer requires, and plans for feeding stalls of simpler type may be obtained from the Department of Agriculture, free on request.

Value of Farm Shelter.

Provision of shade and shelter is sadly neglected on too many dairy farms. Particularly is shelter of value in the elevated portions of the State where cold biting winds can cause a rapid drop in milk yield. The value of a "warm" corner or paddock is known to all stock men, but seldom is much done to improve unsatisfactory conditions.

A Southern Tableland Dairy with the Holding-yard Protected by a Fence.

On a Southerland Tableland farm where a registered A.I.S. herd is kept, it has been necessary to board up one side of the holding yard, as shown in the accompanying illustration. A hedge of Cherry Laurel (very suitable for this district) has been planted to supplement the fence.



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The Use of—

FRUITS AND VEGETABLES IN THE HOME.

JUNE CHANCELLOR, Dip. Home Ec., Fruit Preserving Instructress.

FRUIT AND VEGETABLE SALADS.

NUTRITION experts maintain that, at least, one fresh, raw vegetable should be included in the diet each day to supply certain minerals and vitamins necessary for health. In view of this, salads should be part of the daily menu throughout the year, and not confined to the summer months as is often the case.

Salads served as the main course at a meal are not found to be sufficiently satisfying for some appetites. In such cases salad may be served as an extra course in the form of an individual salad for each person, or a well arranged salad bowl may be placed on the table. It is well to remember that when a side salad is served it need only be small, as such a salad usually consists of portions of prepared fruit and vegetables arranged on crisp lettuce with an appropriate garnish. Mayonnaise or salad dressing should be served either on the salad or in a separate container, depending on the type of salad and the taste of the person.

Salads lend themselves most suitably for luncheon dishes, and when served as a main course may include cheese, hard cooked egg, cold meat or fish. For members of the family taking a cut lunch, some salad vegetable should be packed. Small whole tomatoes and celery carry particularly well.

Important Aspects of Salad Preparation.

The following items are of importance when preparing salads:—

Salad greens must be fresh, crisp and thoroughly washed.

Best results are obtained from chilled vegetables and fruit.

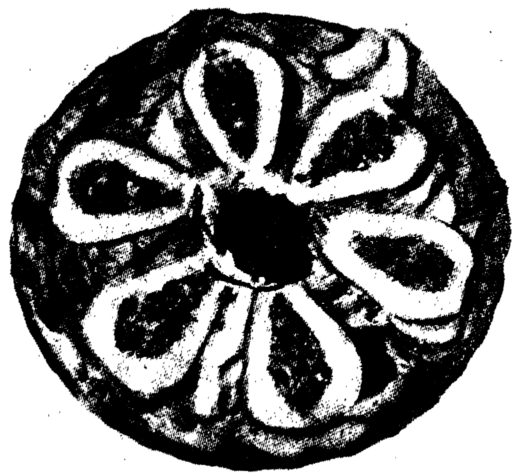
Use a stainless knife for cutting, to prevent discolouration.

If using cabbage with, or in place of lettuce, choose one that is young and mild in flavour.

A well flavoured dressing or mayonnaise should be served, although some prefer just vinegar or lemon juice.

Fruits and Vegetables Suitable.

Lettuce leaves usually form the foundation of a salad, although cabbage, cress, or tender inside leaves of spinach may be substituted. Other uncooked vegetables suitable for use are tomatoes, celery, cucumber, carrots (usually grated), thinly sliced onion and spring onions.



Pear Salad.

Materials—

6 halves of fresh or preserved pears; 1 tablespoon chopped nuts; 2 tablespoon chopped celery; 2 tablespoon mayonnaise; Salt and pepper; Lettuce leaves; Diced Beetroot.

Meth d—Mix together the oelery, nuts and mayonnaise and season to taste. Put this filling in the centres of the pears. Arrange on lettuce leaves with diced beetroot as a centre garnish.

Many cooked vegetables may be used in combination with others to add variety in flavour and colour and to make the salad more substantial. Beetroot, peas, carrots, cauliflower, potatoes and asparagus are suitable.

The fruits most commonly used in mixed salads are oranges, grapefruit, bananas, apples, pears, pineapples and avocados.

Parsley, mint and chives are suitable for garnishing and for added flavour.

Suggested Fruit and Vegetable Combinations.

Listed below are some suggested combinations for fruit and vegetable salads. These should be arranged on lettuce, garnished and served with mayonnaise.

1. Sliced avocado with grapefruit and orange sections.

2. Sliced pineapple with cream cheese.

3. Diced cooked carrots, potatoes and peas mixed with salad dressing and served in tomato cases.

4. Halved pears spread with cream cheese and sprinkled with chopped nuts.

5. Apple rings topped with chopped celery which has been moistened with mayonnaise.

6. Grated carrot, chopped celery and spring onions mixed with mayonnaise and served with sliced tomatoes.

Moulded Salads.

Moulded or jellied salads are decorative and colourful and if well arranged and garnished can lend quite a festive air to an otherwise simple meal. Vegetables such as tomatoes, peas, asparagus, beetroot and carrots and almost any of the fruits are suitable for moulding in a savoury jelly. They can be arranged in quite attractive patterns on the bottom of the mould by first setting in a thin layer of the prepared jelly and then adding the remainder of the ingredients. Jellied tomato puree or juice is very popular because of its colour, flavour and food value.

Always unmould the salad on a dish sufficiently large to allow room for garnishing.

Dairy Farmers Drought Relief Scheme.

Method of Payment Announced.

THE Hon. E. H. Graham, M.L.A. (Minister for Agriculture) has announced the method by which payments will be made under the joint Commonwealth and State Scheme of assistance to dairy farmers in certain districts of this State whose income was affected by drought conditions between the months of August and December inclusive, 1946.

A sum of £234,000 has been made available for this purpose. Each of the two Governments would contribute half this amount.

Payment will be made as grants on the following basis:—

(1) Payments to be made on a commercial butter equivalent basis on dairy produce (as defined in two) in respect of the months, August to December inclusive, 1946.

(2) "Dairy produce" means cow's milk or any produce derived from cow's milk which has been processed at a factory into butter, cheese, dried milk (not being skimmed milk powder), condensed milk or concentrated milk.

(3) Payments to be made at the rate of 2½d. per lb. to suppliers to all factories in districts 1, 1A, 2, 3, 4, 8, and 9 and to suppliers in the Tablelands Section of No. 5 district—such districts being the dairying districts as administered by the New South Wales Department of Agriculture.

(4) Rates to suppliers to all factories not included in (3) to be 1¼d. per lb. commercial butter equivalent.

(5) The scheme to apply only to dairy farmers whose farms are situated in New South Wales.

(6) When a supplier is paid on a basis other than commercial butter, the commercial butter equivalent to be computed by the Department of Agriculture.

(7) Dairy farmers who are registered with the Milk Board or whose milk is used for human consumption are not eligible for payments under this scheme.

"Whilst the relief provided may not fully reimburse dairy farmer-suppliers for their losses during the period covered by this agreement," said Mr. Graham, "it is a sincere gesture by the Government to assist them in a practical way and an indication of its realisation of the difficulties which have to be faced by these primary producers in such times as those through which they have recently passed."

Information was being collected by the Department of Agriculture through the various factories to which the dairy farmers supplied their dairy produce and payment would be made to such suppliers direct by the Department, said the Minister. Mr. Graham expressed the hope that the prompt supply of the desired information by the various factories would permit payment by his Department at an early date.

INSECT PESTS.

Notes contributed by the Entomological branch

The Bronze Orange Bug (*Rhoecocoris sulciventris*).

IN various parts of the north coast of New South Wales the bronze orange bug, at times, becomes a serious pest in citrus orchards and causes considerable injury to the trees. These bugs possess sucking beaks, and feed by puncturing the plant tissues and extracting the sap. In the spring the bugs feed upon the tender growth of the trees and cause the young shoots to wilt and die back. The bugs increase in size, and where heavy infestations occur, the trees may become denuded of their growth. The flowers and fruit stalks may also be attacked and the crop may be lost as a result.

Later, the leaf-stalks and even the older twig growth may be attacked, and this results in a heavy shedding of the mature leaves. In addition to the injury caused by the bugs feeding, the foliage may become scorched and spotted by the corrosive excretions of the insects.

Heavily infested trees become thin and ragged-looking, although generally the destruction of the spring growth and loss of crop are the most noticeable features.

The corrosive fluid ejected by the bugs also causes an appreciable amount of injury and discomfort to persons working amongst the infested trees. The fluid produces severe irritation and inflammation of tender membranes and the skin, in some instances necessitating loss of time and even medical treatment.

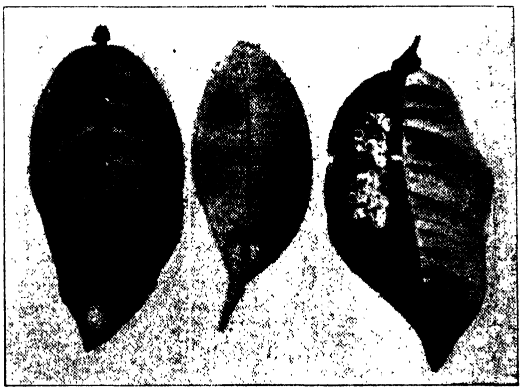
Although this native species of bug is mainly a pest in north coast districts of the State, lesser infestations do occur in orchards farther to the south, and recently an infestation was recorded as far south as Pymble, about eleven miles north-west of Sydney.

Life History.

These bugs grow by a series of moults, and there are five immature or nymphal stages before the adult winged form is reached. There is only one generation each year.

The spherical eggs, which are usually laid on the leaves in groups of about fourteen, are yellowish to pale green in colour, and hatch in from about eight to nine days during January to about fourteen days in late March. Several of these egg batches may be laid by an individual female.

On hatching from the eggs, the young bugs, or first stage nymphs, which measure about ⅛ inch in length, are green in colour and somewhat inflated in appearance. They remain in the vicinity of the empty egg shells but do not feed. A few days later they cast their skins and enter their second nymphal stage in which they remain inactive on the trees throughout the winter.



Stages of the Bronze Orange Bug which may be Seen during Winter.

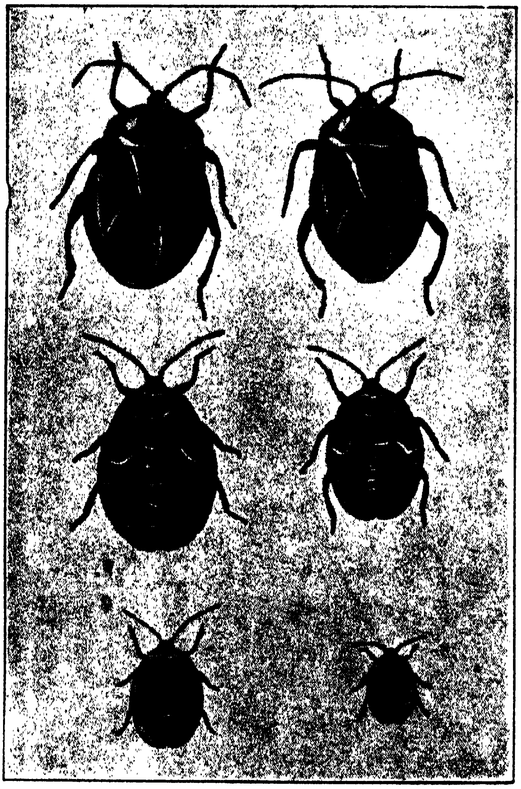
Left.—Second stage (commonly seen). *Centre.*—Third stage (occasionally seen). *Right.*—Empty egg shells.

[*Photo by A. H. Friend.*

The second stage nymphs, which measure ¼ inch in length, are pale green, flattened and almost transparent. It is in this stage

that the bugs are popularly referred to as being in their "tissue paper" stage.

These bugs move away from the site of the empty egg shells, and settle on the under-surfaces of the leaves, sometimes singly, and sometimes in sufficient numbers almost to cover the whole of the lower-surface. Their body colours harmonise so closely with the leaves that even when large numbers are present a careful and lengthy examination may be necessary to detect them. If the leaves are disturbed, however, a faint "buggy" odour betrays their presence.



Bronze Orange Bugs.
Top.—**Adults.** *Below.*—**Immature Stages.**
The one on the lower right is a second stage nymph. Actual size.

Regardless of when the eggs are laid, the second stage bugs do not become active until towards the end of August and early September when they commence to feed on the young, succulent new leaves. The young bugs may be kept alive, without food, throughout the winter. After feeding on the young growth their bodies become distended and darker in colour. They feed for three or four weeks, then cast their skins and enter their third nymphal stage. In this stage they are larger, green in colour and the margins of their bodies may be black. They remain about three weeks in this stage and again cast their skins to enter their fourth nymphal stage, in which they often become salmon or orange-coloured and their wing-buds are evident.

During November, fifth stage bugs become numerous and these may be greenish-grey, salmon or pink. Their wing-buds are larger in this stage, and the bugs are very active and feed voraciously. They also readily discharge their "buggy-smelling" caustic fluid.

The winged adults, which measure about 1 inch in length, are at first greyish-green but soon become dark reddish-brown with a bronze sheen, and it is from this they have derived their popular name. Old adults may become dark brown or almost black.

The adults begin to appear on the trees in December and may be found throughout the summer. Although a few adults may be seen as late as the middle of winter these are weakened and sluggish. Most of the bugs have deposited their eggs and died by about the beginning of April.

The adult bugs are very active and feed upon the young shoots and fruit stalks, and often appear in small groups feeding together. Mating occurs and later egg-laying takes place and the life-cycle is recommenced.

During the summer, when the young growth is absent, the bugs may remain for weeks without feeding, but as soon as the late summer growth commences the bugs begin to feed again and become noticeably distended.

Control.

In their younger stages the bugs may be controlled with the following sprays:—Resin-soda, soft soap, and white oil emulsion-nicotine.

Resin-Soda Spray.

Resin	10 lb.
Caustic soda	3 lb.
Fish oil	$1\frac{1}{2}$ lb.
Water	40 gallons.

To prepare a stock solution of this spray the resin should be ground finely and mixed thoroughly with the caustic soda. This

mixture is slowly added to 2 gallons of boiling water, and allowed to boil for about 2 hours until a clear, dark solution is obtained. The container used for boiling should be capable of holding at least 4 gallons, otherwise, as considerable frothing of the liquid takes place, boiling over is likely to occur. Add the fish oil to the solution and boil again for a few minutes. Stir thoroughly during the cooking and add hot water to make up that lost by evaporation.

For use dilute the stock solution, while hot, with 38 gallons of water to make 40 gallons of spray (or else use at the rate of 1 pint of stock to 19 pints of water). Always draw from the stock solution while hot.

Either 3 lb. 5 oz. of soda ash or else 10 lb. 10 oz. of fresh, clean crystals of washing soda, may be used instead of the caustic soda to prepare this spray.

Soft Soap Spray.

Soft soap	10 lb.
Water	40 gallons.

This spray is easier to prepare and is less expensive than the previous one, and is very effective against second stage bugs. The spray is prepared by dissolving the soap in a small quantity of water and then diluting to give the required concentration.

White Oil-Nicotine Spray.

White oil emulsion ..	½ gallon.
Nicotine sulphate	½ pint.
Water	40 gallons.

This spray also gives excellent results but is more expensive.

Whichever spray is used, it is essential to apply it very thoroughly and to give particular attention to the undersides of the leaves where the young bugs shelter.

D.D.T. Emulsions.

Once the bugs have become active in the spring and have entered their third, fourth or later stages of development, the abovementioned sprays are ineffective against them.

In limited experiments, D.D.T. emulsions, although somewhat slow in their action, have been found to be very effective, and gave good results, even against adult bugs, at concentrations containing 0.1 per cent. D.D.T. To obtain this concentration a stock emulsion containing 20 per cent. D.D.T. is diluted at the rate of 1 part to 200 parts of water (1 fluid oz. to 1¼ gallons).

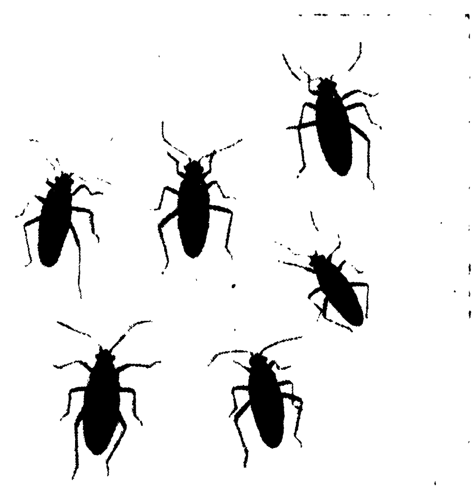
A Native Plant Bug (*Leptocoris lurida*).

DURING the past few months many specimens of this native plant bug have been submitted for identification and some reports of damage to cultivated plants have been received. Most requests, however, have been for measures to control the bugs when infesting dwellings and sheds.

In most seasons, this bug develops amongst native plants, but details of its life-history are not known. The bugs, however, appear to thrive under hot, dry conditions, and in favourable seasons dense swarms cluster on fallen timber, tree stumps and fence posts, and it is at such times they enter buildings.

They have been recorded feeding on cultivated garden plants such as honeysuckle, passion vines and salt-bush hedges. Cultivated fruits, such as peaches, figs and apricots, have also been injured, the latter fruits becoming pitted.

The bugs feed by piercing the plant tissues and sucking up the sap, and they increase in size by a series of moults until the winged adult stage is reached.



Adults of the Plant Bug *Leptocoris lurida*. Actual size.

The adult winged bug, which measures about ½ inch in length, is narrow-bodied and of a general dull reddish-brown, with lighter and darker markings. The body beneath is dull red with a dark area on the middle of the abdomen, and the legs and antennae are black.

The bugs have a wide distribution throughout eastern Australia, having been recorded from South Australia, Victoria, New South Wales and Queensland.

Control.

These bugs have been controlled in buildings with D.D.T. emulsions diluted with water, to give a concentration of 0.1 per cent. D.D.T. This spray should prove equally effective where plants are being injured by the bugs.

Approved Vegetable Seed—April, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Rouge de Marmande — H. P. Richards, Sovereignton, Tenterfield.

Break-o-Day—H. P. Richards, Sovereignton, Tenterfield.

Petrol Tins as Grape-picking Containers.

PETROL tins, so largely used as grape-picking containers, are still hard to obtain, and every care should therefore be taken to see that they are so treated that they are given the longest possible life.

It is not sufficient, however, that the tins shall merely "last." As soon as the surface of a tin shows signs of rust it must be regarded as undesirable as a container. The rust particles are carried to the tanks, become incorporated with the mass of fermenting juice or must, and later with the wine, and a very small excess of iron has been found to cause the disorder known as "blue casse," which is particularly troublesome in white wines.

Experiments carried out by the Department have shown that rusting may be prevented and the life of the tins considerably lengthened by painting them inside and out. A good-quality enamel has been found to give the best results, the surface of tins so treated remaining smooth and hard even after several seasons' constant use.—H. L. MANUEL, Viticultural Expert.

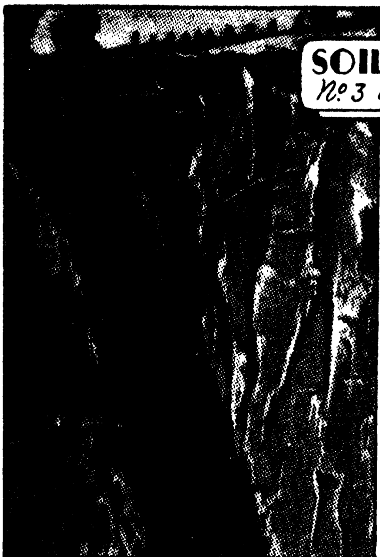
Stone Fruits Thrive on Old Citrus Land.

IN the Hills district (adjacent to Sydney) can be seen many examples of peach and plum plantings growing remarkably well on land that had previously grown citrus—much better, in fact, than similar plantings on other land. Yields of five boxes of peaches per tree in their fourth year are not uncommon, and in some instances crops ranging up to ten boxes per tree have been observed.

It is well known that citrus will not produce as well on land that has previously grown that crop, and this creates a problem in the older citrus growing districts, where a great deal of country once devoted to citrus is now vacant.

The frost-free, elevated position of much of this land in the Hills district makes it particularly suited to early peach and plum production, and it appears likely that a large proportion of the peach and plum supplies during November and December will, in the near future, come from this area.

Already many growers have planted peaches with completely satisfactory results. The limiting factor at present is water supply, for irrigation is essential if fruit size and tree vigour are to be materialised. However, a considerable area in the Hills is now on the city water supply, and it is expected that the service will be extended further before very long.—DIVISION OF HORTICULTURE.



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Gullies decrease farm incomes and, by lowering the water table, waste precious water.

AT RIGHT—Caused entirely by the concentration of water from the roadway. (North Western wheat district of N.S.W.).

Grassed waterways are used for safe conveyance of run-off water from the ends of contour banks. They should be two chains or more wide, with spreader banks across them at short intervals.

GRASSED WATERWAYS

— and contour banks, must be supported by erosion preventing cultivation practices. Most important is CONTOUR FARMING — the ploughing, cultivating and sowing of land parallel to the banks—*never* up and down the slope.

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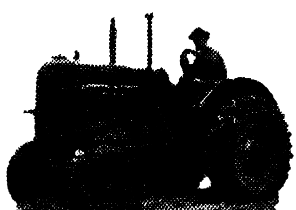

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MOULD WASTAGE IN THE STORAGE AND TRANSPORT OF FRUIT.

S. M. SYKES, B.Sc.Agr., Assistant Fruit Research Officer.

THE loss of fruit by mould wastage is a major problem in storage and transport. The term "mould wastage" is here used in a popular sense and covers all wastage due to fungal rotting. There are many other functional or non-parasitic disorders which, in the past, have caused serious wastage in stored fruit, but, with the improvement of storage technique, these disorders are becoming less important. The result is that a greater proportion of the losses in storage is now due to mould.

There is also some evidence of an actual increase in the amount of rottings in recent years, one possible cause being a change in the orchard spraying schedule resulting in reduced use of copper sprays. In fruit stored experimentally, rotting has often been responsible for more than fifty per cent. of the total wastage.

Even though the number of rotted fruits per case may be small, the value of the fruit lost can be very high when expressed on the basis of the whole season's crop. Thus, the wastage for one season in shipments of Palestine oranges to Great Britain averaged 5 per cent., but the financial loss was estimated at approximately £135,000. A few rotted fruits will reduce the market value of a case to a greater extent than the proportion of fruit lost.

Factors Affecting Mould Development.

The factors determining the amount of mould decay can be divided into two groups: (1) preharvest factors, *i.e.*, those concerned with the growing of the fruit; and (2) factors related to picking, handling, grading, packing and storage.

Pre-harvest Factors.

In the first group would be included all of the many factors which (*a*) affect the fruits resistance to fungal invasion before or after picking, and (b) determine the incidence of rot-producing spores in the orchard.

The variety and type of fruit affect the degree of wastage. Under normal conditions, Valencia oranges show less wastage than Washington Navels. Some varieties of apples are longer-keeping and less liable to mould than others.

The locality, soil, rainfall and manurial treatment all appear to have an effect on subsequent rotting in storage. There is some evidence that nitrogen manuring increases susceptibility to mould attack. Other work indicates that the rainfall, both in amount and distribution affects the degree of rotting. Heavy rain late in the growing season seems to render the fruit more liable to mould attack. The effect of the late rain may operate in several ways:—(1) There may be a direct lowering of the mechanical or physiological resistance of the skin to fungal attack; (2) the skin may be more susceptible to mechanical injuries; (3) the spore load of the fruit may be increased; (4) the moist conditions may favour spore germination. The first two factors may be directly due to growth of the fruit as a result of the rain.

The influence of orchard factors on fruit resistance to mould decay is a complex subject about which information is still incomplete.

Orchard sanitation is important where fungal spores which later cause rotting are present in the orchard. Mould spores may be carried on the fruit for some time without any development of rotting. They may remain ungerminated on the skin or an incipient infection may occur through the lenticels. The bull's-eye rot of stored apples is thought to be due to such a "latent" infection, and there is some evidence that it can be reduced by the application of a late Bordeaux spray.

The destruction of windfalls, the removal of diseased and dead wood, a correct spraying schedule and the maintenance of a good standard of cultivation will help to reduce the chances of infection. These practices are particularly stressed in relation to control measures for brown rot of stone fruits and stem-end rots of citrus fruits.

Picking and Post-harvest Factors.

Of the factors affecting mould decay, those of the second group, *i.e.*, from the time of picking to the end of storage life, are most important in that they are, in general, more subject to control.

Since there are three pre-requisites for satisfactory mould growth—(1) presence of the viable mould spore, (2) access of the mould to the fruit tissue (generally through breaks in the skin, and (3) favourable conditions of frost, temperature and humidity for satisfactory growth—any particular control measure will operate through one or more of these factors.

Maturity.

The maturity of the fruit at picking is related to wastage, the less mature fruit being usually more resistant to fungal attack. Rotting in Navel oranges generally increases with later picking, but in Valencias does not appear to be related to time of picking.* In storage experiments at Homebush in 1942, mould wastage in Granny Smith apples after 14 weeks at 48 degrees Fahr. was 10 per cent. for an early picking and 52 per cent. for a late picking. It must be remembered, however, that the susceptibility to some functional disorders, such as superficial scald in apples and storage spot in oranges, is greater in fruit picked early and the flavour of such fruit may not be fully developed.

Most trouble seems to arise from picking fruit when it is over-mature. Many pear growers use hormone sprays to prevent the dropping of fruit before harvest and, as a result, there is a tendency to leave fruit too long on the trees. Some of the recent losses in stored pears may have been due to the delay in picking following on the application of hormone sprays.

Fruit Size.

The size of fruit is another factor which may influence rotting. There is some evidence that larger apples are more liable to mould attack than smaller ones. The size effect may be an indirect effect of maturity in that larger fruit is, in general, more mature physiologically than smaller fruit from the same picking, and fruit picked later will be larger than fruit picked earlier.

* HUELIN, F. E. (1942) "The Handling and Storage of Australian Oranges, Mandarins and Grapefruit." *Council Sci. & Ind. Res.* Bull. 154, pp. 21-22.

The Picking Box.

The picking box may be a dangerous source of infection. If old boxes are used it may be necessary to sterilise them to reduce the load of rot-producing spores. Steam treatment and the use of a suitable fungicide such as sodium hypochlorite have been effective in reducing mould infection from boxes.

Mechanical injuries may be serious in rough or badly made boxes. The box should be strongly constructed, smooth inside and should be lined on the bottom with wood-wool or strawboard.

Weather Conditions.

Fruit should not be picked wet or too soon after rain. As well as increasing the spread of spores and the chances of their germination, wet weather renders the fruit more turgid and therefore more liable to mechanical injury.

Mechanical Injury.

The importance of mechanical injuries as a cause of mould wastage cannot be overemphasised. The skin of the fruit is a natural barrier to the entry of moulds, and it has been found that most infections occur through mechanical breaks in this barrier. Skin punctures, stem end injury, bruises, scratches, calyx and lenticel injury and insect punctures are all avenues for infection and should be avoided.

While a certain amount of injury in the normal handling of fruit is probably unavoidable, it is certain that, with a reasonable amount of care, much of the wastage from this source could be eliminated.

The use of poor equipment for picking, grading, packing and transport contributes to mechanical injury. In picking, care should be taken to avoid punctures from finger-nails, injury from clippers with citrus fruits, overloading of picking bags and boxes and the rough transfer of fruit from bag to box. The grader and other fruit handling or processing equipment should be carefully checked for sources of mechanical injury. The bouncing or crushing of fruit, the overloading of bins and the accumulation of grit in graders should be avoided. The abrasive action of brushes in citrus processing machinery often results in scratches and punctures on the skin of the fruit. Correct packing is, of course, essential in

the prevention of injury during transport or handling in storage.

Plant and Shed Hygiene.

Apart from the danger of mechanical damage to the fruit the packing house can be a serious source of infection if steps are not taken to keep the incidence of rot-producing spores at a minimum. The frequent removal of accumulated rubbish, especially rotting fruit, is most important, and the periodical spraying of the shed and plant with a suitable antiseptic solution is desirable.

Fungicides After Picking.

Cleaning or fungicidal solutions are sometimes used on the fuit before packing. The dipping of citrus fruit in 5 per cent. borax at 90-110 deg. Fahr. to control green mould or the dipping of packed bananas in Shirlan to control squirter diseases are common commercial practices.

Coatings and Wraps.

The use of waxes and other materials as skin coatings may be beneficial in reducing mould wastage as well as in retaining the condition and palatability of the fruit. Further work needs to be carried out on the possibility of incorporating fungicides in these coating preparations.

Much experimental work has been devoted to the control of decay, particularly of citrus fruit, by wraps treated with mould-inhibiting substances. Di-phenyl wraps have given successful results with citrus and wraps impregnated with copper sulphate are recommended in America for the control of Botrytis rots in pears. Sodium metabisulphite in the form of dust or tablets is used commercially in the prevention of mould decay in packed grapes.

Mould and the Cool Storage Operator.

The following are most important aspects of mould control from the point of view of the cool store operator.

(1) *Prompt Storage.*—The time between picking and cool storage should be reduced to a minimum. If the fruit must be held for some time before packing it should be held in as cool a place as possible. (There are exceptions to this rule, *e.g.*, citrus fruits are sometimes held for a few days at high temperatures to toughen the rind before placing them in store.)

(2) *Rapid Cooling.*—The temperature of the fruit should be lowered as quickly as possible after placing the fruit in cool storage. However, it is not good practice to put warm fruit directly into the store with cold fruit and the use of a pre-cooling system may sometimes be necessary.

(3) *Temperature and Humidity.*—The temperature and humidity should be maintained at the correct levels for the particular fruit. The higher the temperature, the higher is the rate of development of mould; too high a humidity will also favour mould growth. On the other hand, too low a temperature may induce non-parasitic disorders (*e.g.*, low temperature breakdown of apples and storage spot of citrus).

The effect of temperature on the time of development of rots in oranges is shown in the following table*.

Temperature.	Days for Rot to Develop.
92 deg. Fahr.	—
75 ,, ,,	3
70 ,, ,,	4
65 ,, ,,	5
60 ,, ,,	6
55 ,, ,,	8
50 ,, ,,	10
45 ,, ,,	16
40 ,, ,,	30

(4) *Cool Store Sanitation.*—The cool store should be thoroughly disinfected between seasons. The rooms should be first given a hot wash with a suitable detergent solution and then sprayed with a solution of chlorine or sodium hypochlorite. Finally the room should be fumigated with formaldehyde gas.

(5) *The Avoidance of Over-storage.*—Fruit should be removed from store and marketed before it deteriorates to an over-stored condition. The resistance of the fruit to the development of rots decreases as the storage period increases and the losses in over-stored fruit may be very high.

Transport.

Careful and rapid transport to the market is most desirable. Because of the necessity for closer stacking in railway vans, special care must be taken to provide adequate ventilation to guard against sweating and heating which favour rapid rotting.

* TOMKINS, R. G., (1936) *J. Soc. Chem. Ind.* 55: 68T.

Floor dunnage and correct stacking technique will ensure satisfactory air circulation and the prevention of mechanical damage to the packed fruit.

Marketing.

Because of the greater susceptibility to mould after long storage, the object of the wholesale and retail agent should be to dispose of fruit as rapidly as possible. During the period from storage to consumer the fruit should be held in cool, well-ventilated places whenever possible.

It will be obvious that mould wastage in stored fruit is a matter that concerns everyone from the grower to the seller. It is only by a co-ordinated effort in correct cultural, storage and handling methods that the serious losses from this source can be significantly reduced.

Importance of Timely Extraction of Honey.

OWING to the failure of many bee-farmers to organise their work so as to be prepared for the timely extraction of honey, a considerable waste of potential production occurs during every season. The combs become filled with honey, and as the bees cannot continue their productive work, a very substantial loss, even up to as much as £50 in an apiary of 100 colonies, may be incurred in one week by such a hold-up. In addition, where masses of burr-comb have to be contended with, the removal of combs from the over-filled hives is a very difficult proposition. Very often, also, the future welfare of the colonies is affected by honey being forced into the brood nest, where it interferes with the all-important brood-rearing service.

After inspection of the apiaries during a honey flow, it is necessary to decide on the order in which each apiary shall be placed for extracting work, and then to add to the hives in the out-apiaries all available supers in order to keep the colonies awaiting their turn for extraction busily employed in production. A study of the needs of individual colonies will serve a useful purpose, for in all cases some stocks are more progressive in honey storage than others, and these require additional accommodation. There may be instances, too, where supers of combs from non-progressive colonies may be more economically employed on other hives.

Don't Extract "Green" Honey.

Where a bee-farmer is faced with the possibility of loss in production under the circumstances described, and has not prepared an ample supply of hive material to contend with it, there is a temptation to risk extraction of honey before it is properly ripened by the bees. This is a very undesirable practice, and may result in the production of a weak-bodied, inferior product liable to fermentation because of its high moisture content. To be on the sure side it is necessary to wait until a large proportion of the surface of each comb of honey is capped before extraction. The capping-over of the cells of honey is the only definite guide to the bee-farmer that the bees have completed their processing work.—W. A. GOODACRE, Senior Apairy Instructor.

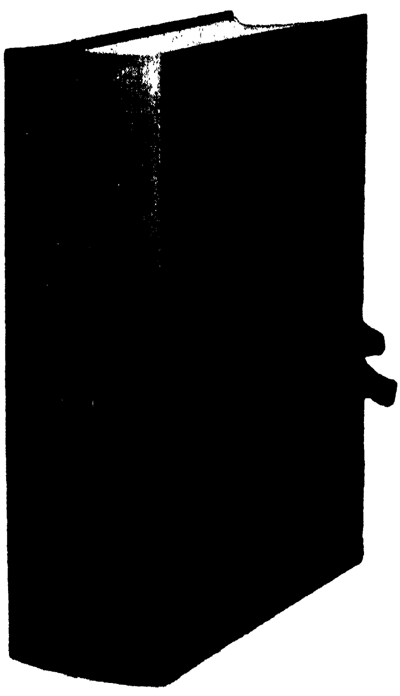
Value of Goats' Milk for Feeding Infants and Children.

GOATS' milk is highly nutritious and, although the flavour is slightly different to that of cows' milk, it is frequently difficult to detect this difference if the goats are properly fed. All milk undergoes a process of curdling in the stomach; with cows' milk the curd is large, hard and tough, whilst the curd of goats' milk is small, light and flocculent, so that digestion is greatly facilitated. Goats' milk has a high butter-fat content—approximately 5 per cent. The fat globules are much smaller than in cows' milk and do not rise readily to the top of the milk in a distinct layer, but the fat is readily separated by the ordinary separator.

The butter made from goats' milk is white, though otherwise of the same appearance and taste as butter made from cows' milk and, when artificially coloured, is indistinguishable from it. Goats' milk is also very suitable for making cheese, and is used very largely for this purpose in Switzerland.

The value of goats' milk for feeding infants and children is well known and its use is strongly recommended by the medical profession for this purpose. Goats' milk is said to be digested in the human stomach in twenty minutes, this being due to the fine curd and the fact that the small fat globules are easily assimilated. For ordinary use goats' milk can be taken fresh and in its raw state, with every confidence in its purity and high nutritive value. Tuberculosis in the goat is almost unknown, especially in this country, and there is no record in this State of undulant fever being contracted from goats' milk.

A twenty-four page illustrated pamphlet on the breeding, care and management of the milch goat is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.



PLANT DISEASES.

BITTER PIT OF POME FRUITS.

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

BITTER PIT is a functional disorder of pome fruits which occurs throughout the world under certain seasonal conditions, and on a wide range of soils. Its occurrence represents a defect in the ripening process, either while the fruit is approaching maturity on the tree, or after picking, while in store or cool store, where ripening continues.

It is important to realise that the trouble is not caused by the operation of any pathogenic organism, nor is it due to any directly harmful element in the sap of the tree.

The most serious manifestation of the disorder in Australia is in apples, and particularly in those shipped overseas, for severe pitting sometimes develops during transport. The discussion which follows is in reference to bitter pit of the apple.

Symptoms.

The outward symptoms of the trouble consist of small, discoloured spots showing through the skin, the discolouration often being a slightly darker shade of the normal colour of the apple. These spots develop into small, more or less rounded, brown or

Fig. 1.—Tree Pit, Normal Type.
Note that the spots and pits are more numerous towards the calyx end. As this apple continues to ripen, the pits will become more definite and depressed. This type occurs more frequently in the cooler districts.
[*After Carne, Pittman and Elliot.*

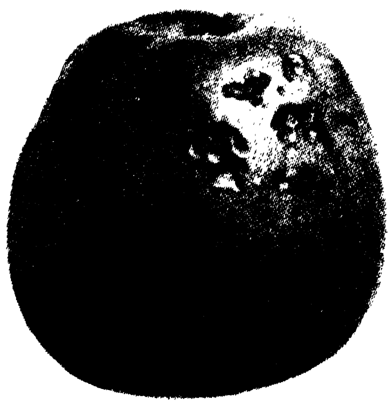


Fig. 2.—Tree Pit, Blotchy Type.
The depressions are larger and more irregular than in the normal type. In bad cases the shape of the fruit is more or less malformed. This type occurs more frequently in the warmer districts.
[*After Carne.*

occasionally red, sunken pits of diameter usually between ⅛ inch and ¼ inch, which are more numerous towards the calyx end.

Beneath each pit is a small, brown, conical-shaped area of dead flesh. This area, which consists of dead cells, is tougher in texture than the normal flesh and more spongy in appearance. If the fruit is cut across with a knife, brown areas of about the same diameter as the pit may be found scattered throughout the flesh of the fruit from the core to the skin, but are usually more numerous in the outer flesh.

This condition does not develop into a rot, as the skin is not broken, and the brown tissue merely consists of dead, dry cells. Affected fruit will keep as well as normal fruit. However, the market appearance and value are seriously reduced, and affected fruit often has a bitter taste.

Bitter pit is often confused with cork or boron deficiency diseases, but the two condi-

tions are quite distinct (*see* Plant Disease Leaflet No. 93, "Cork or Boron Deficiency Disorders of Pome Fruits," which is available from the Department).

Seasonal Occurrence and Factors Favouring the Development of Bitter Pit.

Bitter pit is, in large measure, seasonal in its occurrence, and growers who sustain losses in one season need not necessarily anticipate similar losses the following season. Weather conditions which are conducive to a rapid rate of transpiration or loss of water, *i.e.*, high temperature and low humidity, as well as to fluctuating soil moisture conditions, favour the development of bitter pit, if they occur at the time during which the fruit is commencing to mature.

In general, the fruit from young trees is more susceptible to bitter pit than fruit from old trees, except where old trees are carrying light crops. All fruit whch is larger than normal for the particular variety, fruit from trees which have been given a late irrigation prior to picking, and fruit from trees which have been pruned heavily, are those which are particularly liable to the disorder when the variety concerned is a susceptible one.

These points should be borne in mind when considering control measures.

Varietal Susceptibility.

Some varieties of apple are more susceptible to bitter pit than others. Particularly susceptible varieties in Australia are Cleopatra and Sturmer, whereas many others, such as Cox Orange Pippin, are susceptible when the trees are carrying light crops. Varieties which are highly coloured or which have a low acid content are less liable to the disease.

Highly susceptible varieties such as Cleopatra are rapidly disappearing from the apple industry in New South Wales largely because of the difficulty experienced in control of bitter pit. Susceptible varieties which are now of commercial importance are as follow:—Granny Smith, Delicious, Jonathan, Democrat, Rome Beauty, McIntosh Red, Crofton, Dougherty and Stayman Winesap.

Types of Bitter Pit.

Bitter pit may be divided into two main groups, viz.:—1. Tree pit, *i.e.*, pitting which develops while the fruit is on the tree; and 2. Storage pit, *i.e.*, pitting developed after the fruit has been picked.

1 *Tree Pit.*—On the tree the occurrence of this disorder, which begins to show up a few weeks before normal picking maturity, is very erratic. Although every fruit may be affected, the appearance of the condition is sometimes confined either to all or a few fruits on a single branch.

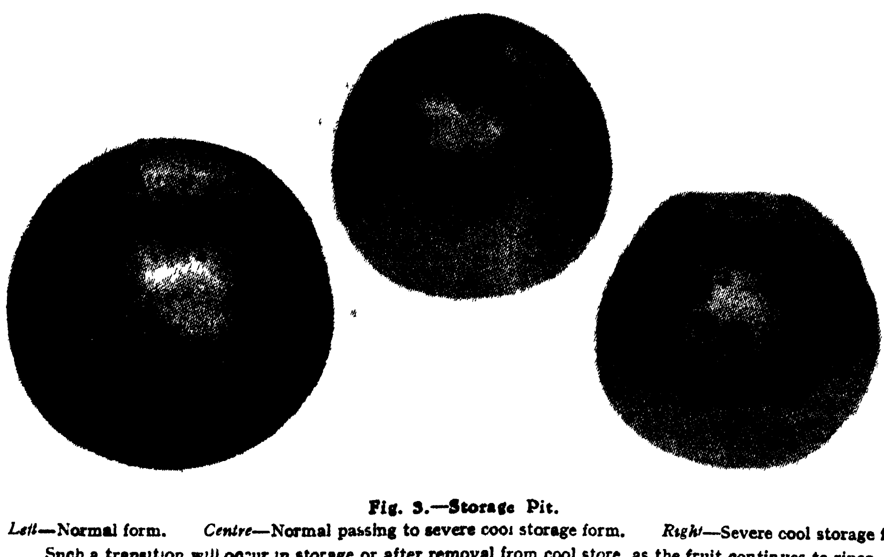


Fig. 3.—Storage Pit.

Left—Normal form. *Centre*—Normal passing to severe cool storage form. *Right*—Severe cool storage form.
Such a transition will occur in storage or after removal from cool store, as the fruit continues to ripen.

[*After Carne.*

Early pickings are more likely to show tree pit on the market, as the external symptoms may be slight or not developed at picking time. In later pickings of more mature fruit, the symptoms will be evident at picking time and affected fruit can be discarded, so that little or no fruit showing tree pit is marketed.

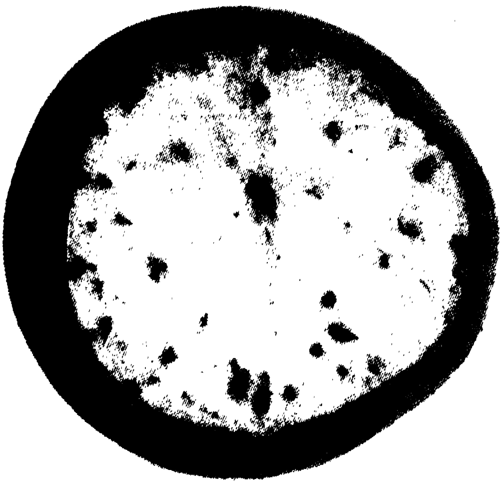


Fig. 4.—Internal Lesions of Mild Storage Pit (From Cold Store).
Note that the brown areas of dead flesh (lesions) are more numerous in the outer flesh.
[*After Carne, Pittman and Elliot.*

2. *Storage Pit.*—This is essentially the same disease as the above, the separation being based primarily on time and place of development, as the fundamental cause still lies in the ripening process, for fruit continues to ripen in store and, at a slower rate, in cool store.

If fruit which would have pitted on the tree is picked and placed in store, it will develop storage pit as ripening proceeds. On the other hand, fruit which would not have pitted on the tree should not pit in store, provided that picking has been delayed to allow the fruit to reach adequate storage maturity. Thus it is seen that those factors which are responsible for tree pit also contribute to the development of storage pit.

However, the major cause of the development of storage pit appears to be picking the fruit in a relatively immature state. If the fruit can be left on the trees till it is sufficiently mature, storage pit should, in large measure, be avoided. The safe picking maturity stage is a variable one, particularly with light crops of susceptible varieties, and no generally acceptable practical rule can be set down, the decision as to the correct stage at which to pick being largely a matter of experience*. It is essential that the picking date should be decided on the basis of maturity and not on size alone.

If picking is delayed for a maximum time the fruit should be placed in cool store within a few days to prevent it from becoming over-ripe. This applies particularly to large fruits and to varieties like Jonathan which are very subject to internal breakdown or over-ripeness.

Bitter pit in overseas shipments in considerably reduced by later picking and by placing the fruit in cool storage as soon as possible after picking.

Control Measures.

The following points with regard to the control of bitter pit should be considered with regard to your orchard:—

1. Prune lightly. For susceptible varieties the system of pruning adopted should

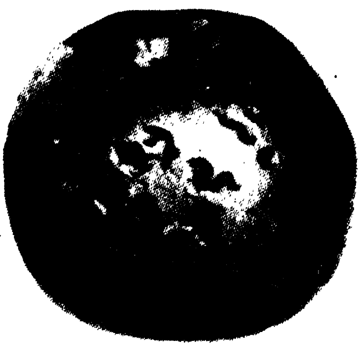


Fig. 5.—Storage Pit, Lenticel Blotch Type (on Jonathan).
This form has frequently been confused with Jonathan Spot because the underlying affected tissue is often removed in peeling. Spots are larger than in Jonathan Spot, definitely sunken, occur mostly on the calyx half of the fruit and are subject to fungal rots. Internal storage pit is almost invariably associated.
[*After Carne.*

*Information with regard to the correct stage of maturity for picking the various varieties of apple and pear, for storage purposes, may be obtained from District Fruit Instructors, or from the Division of Horticulture of this Department.

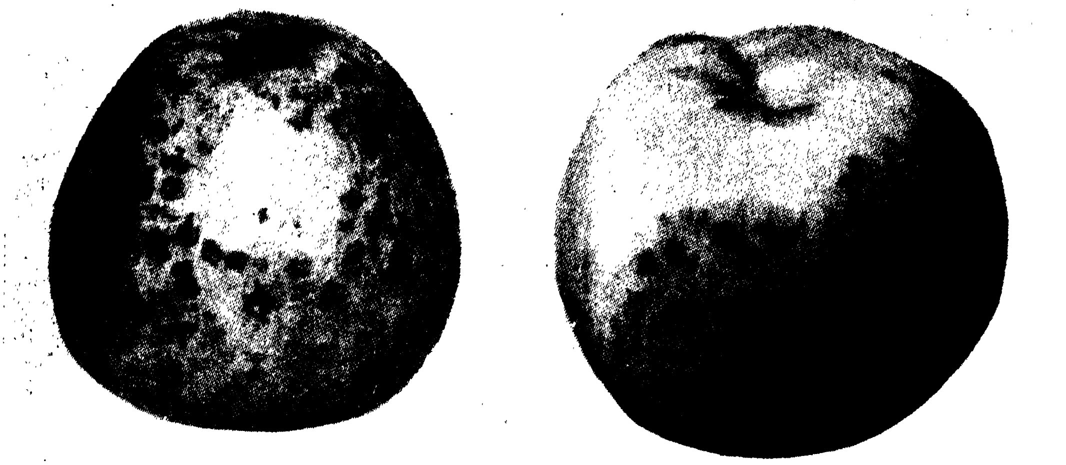


Fig. 6.—Jonathan Spot: Worcester Pearmain (*Left*) and Jonathan.
The spots which are ill-defined are not sunken and may occur anywhere on the fruit, but often are more abundant on flushed surfaces and towards the stem end. Spots become slightly sunken as the fruit wilts. It may develop in fruit on the tree, but most commonly in stored fruit. (Compare with Fig. 5).

[*After Carne.*

be such as to aim at the production of a regular crop of evenly distributed fruit.

2. Provide drainage where necessary.

3. Conserve moisture by the suppression of excessive weed growth during dry periods.

4. Avoid manuring during the growing period, and avoid irrigation when the fruit is approaching maturity, in order to maintain an even growth rate.

5. In varieties which are particularly susceptible to pit, delay picking so that tree pit will have time to show up, and the fruit will be sufficiently mature to control the development of storage pit.

Acknowledgement.

Generous use has been made in this article of the description of the disease given by Mr. W. M. Carne of the Department of Commerce and Agriculture, in his publication on "Non-Parasitic Disorders of Apples."

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Kendall	April 11
Stroud (Miss J. Neville)	April 11, 12
Gunnedah	April 16, 17, 18
Kempsey	April 16, 17, 18
Bathurst	April 17, 18, 19
Hawkesbury	April 17, 18, 19
Macksville	April 18, 19
Bellingen (C. P. Franey)	April 22, 23
Orange	April 22, 23, 24
Narrabri	April 23, 24
Wallamba	April 23, 24
Grafton (C. W. Creighton)	April 24, 25, 26
Horsley (J. Hill)	April 26
Wellington	April 29, 30
Bonalbo	April 30, May 1
Forbes (E. R. Woods)	May 2, 3
Dubbo	May 5, 6, 7
Gulargambone	May 10
Coonamble	May 13, 14
Trangie (R. R. Bailey)	May 20, 21
Gilgandra (Allan Christie)	May 20, 21
Walgett	May 22, 23
Condobolin (N. J. Hanlin)	August 5, 6
Trundle (W. A. Long)	August 12, 13
Peak Hill (C. McDowall)	August 19, 20
Parkes (L. S. Seaborn)	August 25, 26, 27
Wagga (G. Dewey)	September 2, 3, 4
Forbes Show and Sports Day (E. R. Woods)	September 6
Walbundrie (C. Leischke)	October 1

The Influence of—

THE RECENT WAR ON THE LIVESTOCK DISEASE SITUATION.

Value of the Veterinary Quarantine Service.

MAX HENRY, B.V.Sc., M.R.C.V.S., Chief, Division of Animal Industry.

SUFFICIENT time has elapsed since the end of the war to warrant a review of the influence the war has had on the livestock disease situation. Australia has been particularly fortunate; not merely because, except swine fever, no disease has been known to be introduced, but because the importance of a strong veterinary quarantine service has been so amply demonstrated that it is unlikely that the Governments concerned will willingly see such a service weakened.

The full significance of the danger to which Australia was exposed was made clear only by the report of the Army Veterinary Mobile Unit which carried out a survey of the islands to the north of Australia which had been occupied by the Japanese, and took action to prevent persistence of a serious group of diseases in those islands.

Difficulty of Effective Wartime Control.

War has always been a major factor leading to spread of disease by the temporary obliteration, not only of border control, but also of internal control. Even in countries which were not the scene of actual hostilities, the exigencies of the time led to temporary relaxations of control.

To one of these relaxations must be attributed the outbreak of swine fever in Western Australia and New South Wales. Fortunately, experiences of the outbreak in 1927-28 had been recorded and the methods of eradication successfully used then were clearly set out. Thus there was available, for reference, a definite plan of campaign. The result was that the outbreak was completely controlled and the disease again eradicated from the Continent. It is impossible to estimate Australia's consequent monetary saving, but study of the unhappy situation which persists regarding this disease in the United States of America is sufficient guide to probabilities.

The outbreak of swine fever was spectacular, and naturally caught the public mind; but all through the war years Federal and State authorities, acting through their veterinary quarantine services, were keeping vigilant watch on introduction of animals and animal products which might have been the means of introducing disease into this country. Most difficult of all measures to enforce was prevention of smuggling by sea and air. As long as there was constant war traffic with the islands to the north of Australia the danger persisted. It is realised that those concerned in smuggling did not comprehend the possible results of their actions, but they must have understood that the rigid restrictions imposed had behind them a serious reason.

Whether the greater credit be allowed to luck or management, the fact remains that no case of rabies, foot and mouth disease, surra, rinderpest, equine encephalomyelitis, equine infectious anaemia, or newcastle disease of poultry, has been recorded in Australia as a result of war-caused difficulties.

These were the conditions which gave gravest anxiety to officials. Normal quarantine services covering introduction of stud stock were in abeyance, but as there have been indications of a revival of the traffic, steps have been taken to place quarantine stations in order and they are already in use.

Internal Controls Maintained.

Control of disease within the State has continued and has been improved by the return from the armed forces of Veterinary Officers and Inspectors of Stock. Fortunately, the staff was not so depleted as to

prevent action on the more serious epizootic diseases such as pleuro-pneumonia of cattle and anthrax.

Turning from factors associated directly with the war, it may be noted that during the latter years of hostilities the situation regarding certain parasites of stock became more serious. Thus the spread of stickfast flea of poultry into more closely settled districts than those of the Western Division has necessitated a revision of the programme and an increase in the staff carrying out routine inspections in the affected areas. The movement of the buffalo fly southwards in Queensland has been checked by dry seasons, but the invasion of New South Wales cannot long be deferred. Steps are being taken to slow down its onward movement when it does reach this State, and the satisfactory results of the use of D.D.T. against this parasite have been made known to officials and farmers. It may not be possible to eradicate the fly, but its incidence can be kept down if stockowners themselves take action. Luckily the fly has not been incriminated as a spreader of disease.

Work against the cattle tick was not seriously interfered with by the war and has been continued. The Grafton-Maclean areas have been released, except for a small section where fences were damaged by storms. Difficulties arose in connection with the continuance of eradication campaigns because of lack of fencing material and labour, but these troubles are temporary. Safety of the clean country depends on active prosecution of eradication and control methods. If these are not maintained in full vigour there will always be danger of spread. The unusually severe drought in the far north coastal districts has had unsatisfactory repercussions on the incidence of tick life, as many of the cattle for a time were too poor to dip.

Increased Vigilance Necessary.

With labour and dip supplies returning to normal it is possible to concentrate on control of lice, ked, and mite in sheep. Unfortunately, drought conditions in the northern sheep districts have hindered operations, but action has been generally tightened up. This move was started by rigid action at the annual ram sales in Sydney. The fact that manufacturers are now in a better position regarding supplies of necessary ingredients for dip fluids and powders will encourage stockowners to dip regularly and carefully. Much depends on clean musters and on following the directions of the manufacturer of the dip fluid or powder used. If dips have been out of use for some time a thorough cleaning out is more than desirable. It is unfortunate that more community dips are not established, particularly as there is an increase in the number of men who run only small flocks.

Although the State has been comparatively free from epizootic disease, other disease conditions are causing serious economic loss. The three most important disease conditions of dairy cattle are mammitis, abortion and sterility. The position regarding mammitis is becoming more favourable as the use of sulphanilamide and penicillin become more practicable. Production and use of these drugs, and of D.D.T. and "666" has probably been stimulated by war-time necessities. Sterility is a serious problem with which farmers will need veterinary guidance. The growth of a system whereby dairy co-operative societies employ veterinarians for work amongst their own suppliers, would bring beneficial results in connection with this condition.

Soldering Dairy Utensils.

No farmer has to use tinware of various descriptions to the same extent as the dairyman, and an elementary knowledge of the use of the soldering iron is of particular value in his case. In fact, it might almost be considered a necessary part of a dairy farmer's training. The mending of leaks, the retinning of rust spots, the refixing of milk-can hoops, etc., are all jobs that are possible to a man determined to master a few essentials of the process.

It is the continuous neglect of the rough places in tinware that has such a serious effect on milk and cream quality, by affording lodging places for decaying milk and cream.

The process of soldering, with particular reference to its use on a dairy farm, is the subject of a leaflet which may be obtained free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

SUSTENANCE FOR A CITY

There are many things we take for granted. We have no worries about them because they are always where we want them. Often we are inclined to overlook the fact that our privileged position has been made possible by the thought and action of others.

Among the things that the citizens of Sydney take for granted are the fresh foods brought to them daily by train from the producing areas in New South Wales and other States. Probably few of them pause to consider the vast organisation that is necessary to maintain a regular supply of these necessities of life to a population of 1,500,000.

The quantities of some of the items hauled by train to the City in a period give an idea of the work the railways are doing. For example, in a week, 2,500 tons of frozen beef and mutton, 200 tons of rabbits, 60 tons of bacon, 100 tons of fish, 40 tons of dressed poultry, 1,200 tons of butter, 70 tons of cheese, 160,000 gallons of milk, 1,000 tons of root vegetables, and 5,500 tons of fruit are brought to the City by train from areas which, in some instances, are many hundreds of miles away.

While the citizen of Sydney sleeps, fast freight trains are travelling through the night. They are converging on the City from the north, the west, and the south, to supply his needs. His sleep is not disturbed by the thought that the supplies will not arrive. He has taken a safe and dependable service for granted.

S. R. NICHOLAS,
Secretary for Railways.

STUD PIG PURCHASES

BY THE OVERSEAS STUD STOCK DELEGATION.

"PIG breeders in New South Wales may well be proud of the fact that after visiting the leading studs of Great Britain and Canada we could find only three boars and seven sows which measured up to the standard of type and quality we were seeking." This statement was made by Hon. E. H. Graham, M.L.A. (Minister for Agriculture) when referring to the pig purchases made by the Stud Stock Delegation which he recently led overseas.

"The pigs purchased" said Mr. Graham "were carefully selected for individual breeding and quality and will provide new strains of blood which should be of great value to our stud breeders."

"A survey of the pigs in Britain and Canada revealed, without any doubt, the supremacy of British breeders of Large Whites, but made it equally clear that our Australian breeders are ahead of them with Berkshires and Tamworths. I am convinced that we have pigs here which would do much to improve those two breeds both in Britain and Canada."

The two Large White boars purchased—"Histon Berry Lad" and "Solihull Maple's King 3rd"—come from two leading English studs whose owners were noted for their sound breeding methods. The four Large White sows—"Moncur Baroness 11th," "Whittingham Lassie 128th," "Solihull Queen 20th," and "Histon Beryl 580th"—were typical specimens of the breed and had been mated to boars of high quailty.

The Tamworth boar, "Carriston Up-to-Date 6th" and the Tamworth sow, "Carriston Maple 3rd," were prize-winners at the York Sale and Show, last November. They were of good quality and colour and were bred by Mr. Thos. Lawson of Carriston—recognised as the largest and most successfull breader in Great Britain to-day.

Two Berkshire sows—"Roundhill Lady Diana 6th" and "Swinton Farewell 13th"—complete this consignment. Both were also in the prize-list at York. "They are of the modern English type and should 'nick-in' well with our Australian type of Berkshire," said Mr. Graham.

Mixed Types in U.S.A. and Canada.

The outstanding impression gained in U.S.A. and Canada, said Mr. Graham, was the high standard of technique seen in the packing plants (bacon factories). Americans in, particular, were most ingenious in correcting faults in carcase quality by skilful factory treatment.

"We found that the Large White was the most popular breed in Canada, constituting 95 per cent. of the total pig population," said the Minister. "Thus there are comparatively few Tamworth and Berkshire studs in operation. The choice of breeding stock was accordingly strictly limited in those two breeds.

"In all three breeds, there was much evidence of mixed type. It appears that eight or nine years ago, a swing took place towards a short-headed, thick type of pig. The result was most unfortunate and breeders are now trying to get back to the original Canadian type as we know it in Australia. Meantime, considerable variation is to be found in type and colour, and in the circumstances it was felt that it would be most unwise to consider importation of Canadian pigs until a fixed type was again stabilised.

"In Canada, carcase grading has been developing to a high degree of efficiency. At every packing plant, a staff of expert Government graders is employed. These men decide the grade of each carcase passing through the works and the rate per lb. at which a supplier is to be paid. In addition to this Government grading, the carcases are sorted several times by the factory-hands to ensure that each batch of carcases leaving the plant is as uniform as possible for type, weight, and quality of carcase. From a selling point of view, the result is most effective.

"In Australia, we shall have to face up to the urgent necessity of instituting an efficient grading scheme, and of overhauling

our factory processing methods, if we hope to gain our due share of the world markets."

Lessons from Denmark.

One of the highlights of the trip was a rapid tour of Denmark. "We were deeply impressed by the Danish Landrace pigs," said Mr. Graham. "As a breed they are probably better than can be found anywhere in the world. They not only breed exceptionally well, but they produce carcases of high uniform quality."

It was noteworthy that in Denmark, agriculture was recognised as the leading industry of the country and was given whole-hearted support and encouragement in any effort towards improvement, said Mr. Graham. Their agricultural colleges, experiment farms and research institutes were fully staffed and equipped with the most modern plant and their abattoirs and bacon factories were also built on up-to-date lines.

On the farms, evidence was to be seen on all sides of the pride the owners and their employees took in their work. Farm houses and buildings were in good repair and freshly painted, paddocks were well laid-out and entirely free from weeds and livestock were all in excellent condition despite serious feed supply difficulties.

"Australia has much to learn," said Mr. Graham, "from this small nation of four million people living in a land of low natural fertility and facing a climate which is harsh and severe for many months of the year."

Imported Rams Arrive.

First Shipment of Sheep Purchased by Delegation.

ONE Dorset Horn and three Border Leicester rams, purchased for the Department of Agriculture by the New South Wales Stock Buying Delegation, were among the thirteen stud sheep which arrived by the *New Zealand Star*. The other eight rams and one ewe were bought for private breeders. This is the first shipment to arrive of sheep purchased by the delegation.

The sheep would remain in quarantine for four weeks, after which the Department's Dorset Horn ram would be sent to Wagga Experiment Farm for use in the stud there and the Border Leicesters would be stationed at Wagga, Cowra, and Trangie farms, where they would be available for service of ewes from private studs, said the Minister for Agriculture, Mr. Graham.

This was the first time, said the Minister, that service by Department-owned stud rams had been made available to private breeders. In that way, he considered, the benefits of these high-grade imported rams would be given widest and quickest spread among the State's flocks.

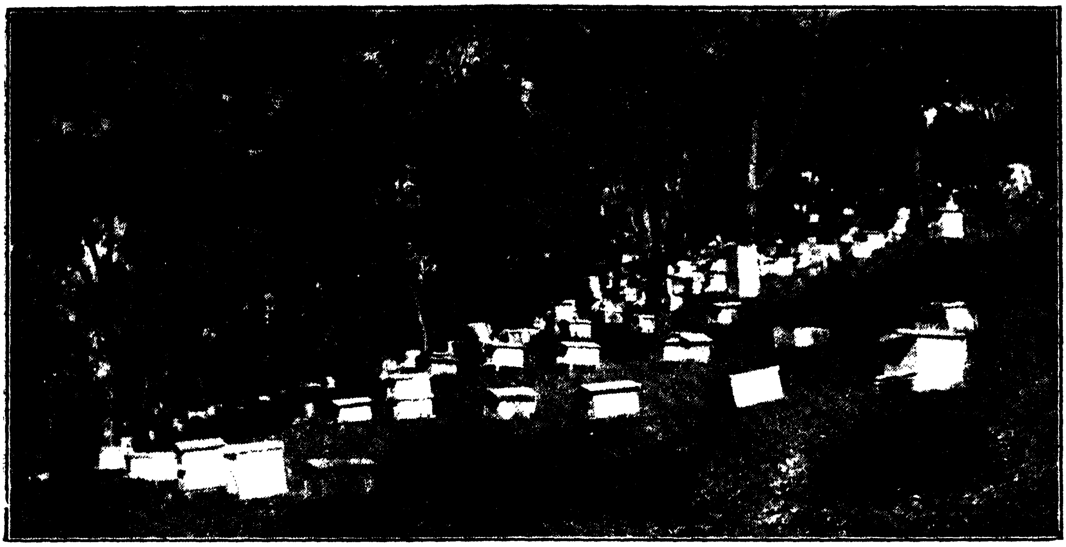
Stud breeders had been invited, through the Australian Society of Breeders of British sheep, to make application for service of ewes. Fifty ewes had been allocated to each ram and the charge was £2 2s. per ewe, which included agistment for the six-weeks' mating period. Mating of ewes with the imported rams should commence about the first week in April, said Mr. Graham.

Potential Danger to Turkeys from Grasshoppers.

THE spiny character of the grasshopper anatomy makes the insects a source of danger to the foraging turkey.

A recent report in the *Canadian Journal of Comparative Medicine and Veterinary Science* states that six healthy turkeys had died from eating grasshoppers. It was concluded that the birds had probably died because of irritation or actual puncturing of the crop by the hard parts of the grasshoppers, particularly the spined legs. It has been observed in Alberta and Montana that gallinaceous birds are killed in this way when they eat large numbers of grasshoppers without appreciable quantities of other foods. Non-gallinaceous birds are said to be not affected. It is suggested that turkeys should be given a large quantity of mash in the morning, again at midday, and whole grain in the evening to prevent them roaming for food.

We have had reports in New South Wales that turkeys have been killed by eating grasshoppers. Mr. C. L. G. Fielder, Stock Inspector, recently reported that a cat which had developed a taste for grasshoppers died as a result of eating them. Post-mortem examination of the cat revealed a large ball of grasshoppers in the stomach, and death was apparently due to peritonitis caused by the spines of the grasshoppers' legs penetrating the stomach wall.—T. McCARTHY, Chief Entomologist.



APIARY NOTES

OVERCROWDING APIARY SITES

Is an Undesirable Practice.

Lack of Initiative Increases Disease Risk.

D. L. MORISON, B.V.Sc., Apiary Branch.

LACK of knowledge of the honey and pollen flora covering the various districts where migratory work is being practised has prompted quite a number of apiarists to act on the advice of others with more experience, and duplicate their moves. Actually there is nothing against this "follow-the-leader" practice, except that in some cases it results in overcrowding, whereas with a little individual initiative the same type of country could be found and worked without recourse to placing apiaries side by side.

Even in places where the honey flow may be ample to provide for large numbers of colonies the overcrowding is very undesirable because of the risk of spreading brood disease, particularly American Foul Brood (Bacillus larvae). Robber bees are a major factor in the spread of disease, and with overcrowding where some of the apiarists have poor type extracting room outfits there is plenty of scope for robber bees to become active.

The crowding of bees about Toukley during the autumn of 1946, when one or two of the apiaries moved to that district must have contained hives infected with "A.F.B.", gave ample proof of the danger of over-crowding. Over four thousand hives of bees were established within a range of a couple of miles. The disease was spread to other apiaries, and caused a good deal of anxiety both to the Department and beekeepers concerned.

Whilst some beekeepers are now disposed to avoid overcrowded localities, the habit of congregating on one area was again observed during March this year, when thousands of hives were crammed into areas in the Bargo country of the Picton-Mittagong district.

It is to be hoped that the Toukley trouble will not be repeated as a result of this unnecessary over-crowding. Ample Grey Gum and Bloodwood country, similar to Bargo, was available with comparatively few bees on it.

The Haphazard Development of the Migratory System.

Any beekeeper who has kept abreast of recent developments in migratory beekeeping must admit that this important phase of his industry has, in many respects, developed in a haphazard manner according to circumstances.

Migratory beekeeping is a highly specialised industry, and for successful operation requires a detailed knowledge of the

Experienced Migratory Beekeepers Examining a Hive.
[*Australian Women's Weekly* photo.

honey and pollen flora and climatic conditions in the districts in which the work is to be carried out. It is understandable, therefore, that many who have undertaken migratory work have done so with insufficient knowledge and experience to make the best of it. Thus we find beekeepers moving to contact winter honey flows with the colonies not in the right condition to carry on successfully—just because experienced migratory men have moved their bees. The point is not taken into account that the experienced men have conditioned their bees on coastal areas where progressive brood-rearing was evident, thus providing a large force of young bees together with a good supply of pollen in the hives just previous to transporting them to the selected winter honey-flow country. The colonies are thus prepared to withstand the arduous conditions with which they will have to contend.

At times the movement of bees into some parts of the country resembles a gold rush. And at times we find bees dumped down on unsuitable sites where the health of the bees is at stake, and unnecessary over-crowding occurs. This can all be avoided if time is taken to inspect similar types of country. An instance of the results of placing bees on unhealthy sites occurred during the last good flowering of the Spotted Gum on the South Coast. Bees established on well-drained, sunny sites kept in good condition, whereas those placed low down in shaded valleys suffered severely from dwindling: dysentery was a prominent symptom.

Immediate Notification of Brood Disease Outbreaks is Required.

The suppression of any "A.F.B." disease is greatly facilitated when the Department is notified immediately the disease is located—as required under Section 4 (a) and 5 of the new Apiaries Act. However, some migratory apiarists appear to be under the impression that, because their outfits are wholly mobile and often placed in remote places, they can do as they please in the matter of dealing with disease, without notification. The Department takes a very serious view of the adoption of this attitude. Prompt notification of the outbreak may lead to discovery of the source of infection and the avoidance of other outbreaks.

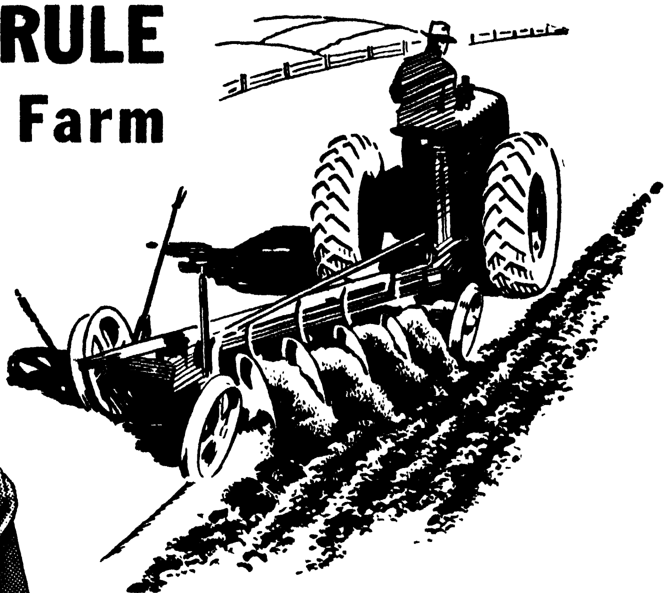
In the hope of overcoming some of these problems by inducing beekeepers to notify outbreaks of disease, the Department has approved of the Bee-diseases Compensation Scheme as referred to in the last month's issue of the *Agricultural Gazette*.

Addressing of Specimens Sent for Examination.

To avoid any delay, samples of brood comb and specimens of bees sent to the

(*Continued on page* 218.)

A SIMPLE RULE to Conserve Farm Machinery!



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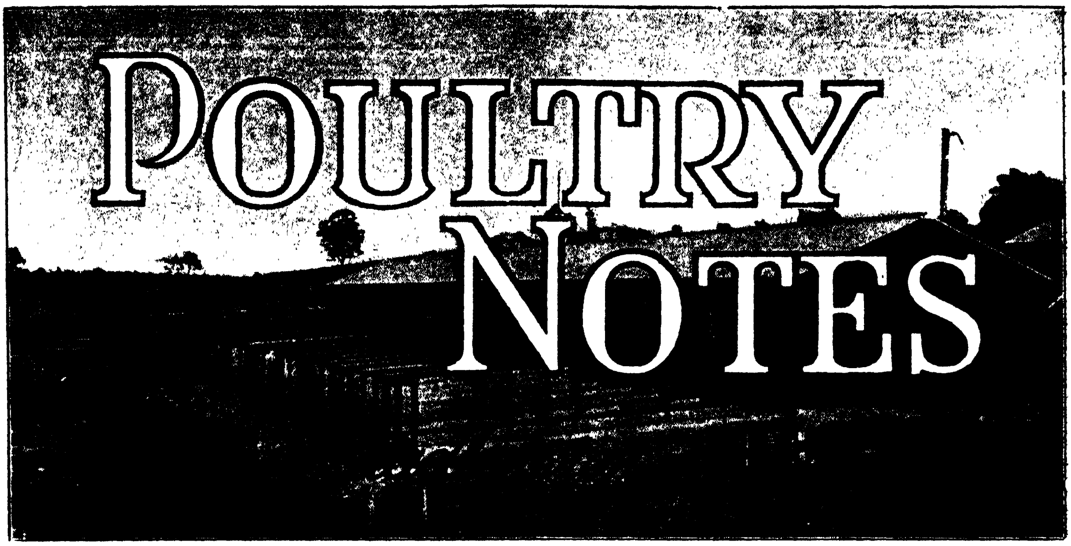


The Coming Rearing Season.

OWING to the unsatisfactory feed supply position many poultry farmers are undecided as to whether they should undertake the raising of the usual numbers of chickens this season. While this is a matter which can only be decided in accordance with the position of the individual farmer as regards feed supplies, it may be of assistance to outline the main considerations involved.

In the first place, although the recent widespread rains will ease to some extent the demand for mill offals for larger stock, there appears no possibility of any increase in the quantity of wheat available for poultry feeding. The only additional source of feedstuffs likely to be available is grain sorghum and limited amounts of oats and barley. While the grain sorghum crop will not be as large as anticipated owing to the continued dry weather in the areas where it is grown, there should be an appreciable quantity to augment present quotas of wheat, but at best it will only provide about 20 per cent. of the grain requirements of present flocks, or an equivalent amount in meal.

It has also to be realised that a continuance of the wheat supply is largely dependent upon transport from other States and any hold-up could alter the whole situation in a short time.

Thus, there is an element of "gamble" in undertaking even the usual rearing programme, and certainly no established poultry farmer should contemplate any increase in flocks this season.

Those who have some reserves of feed would be justified in taking the risk of raising normal replacements, but where supplies are strictly limited to current requirements, the best course would be to defer raising chickens until later in the season or until such time as it can be seen whether feed will be available. The extent to which the chicken-rearing operations may be delayed will be governed by the rearing capacity of the farm. If sufficient brooding and rearing equipment is available to raise the required number of pullets in one lot, it would be possible to defer obtaining chickens till as late as towards the end of September; whereas if two batches had to be put through the rearing equipment it would be advisable to commence operations about six weeks earlier at least, to allow of the pens being cleaned up between the two lots.

Where cockerels are used for breeding it would, of course, be necessary to obtain them earlier in the season in order to have them sufficiently mature for next season.

Amount of Feed Required.

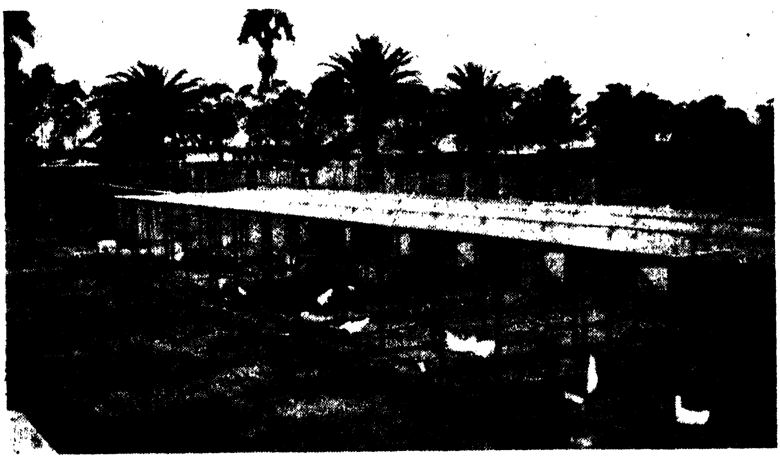
Very few producers are able to estimate accurately the quantity of feed necessary for raising pullets to productive age, and the following particulars, based on the mash and grain feeding system in feeding trials at the Poultry Experiment Farm, Seven Hills, will enable anyone to assess requirements for any given number of chickens.

Food Consumed per 100 Chickens for Each Four-weekly Period.

	lb.	oz.
1st 4 weeks	100	0
2nd 4 weeks	250	0
3rd 4 weeks	400	0
4th 4 weeks	412	8
5th 4 weeks	450	0
6th 4 weeks	450	0
Total for 24 weeks ..	2,062	8

chickens at the one time. Where this is done, a greater number of eggs for incubation must be obtained at one time, and these cannot be produced from the pick of the flock; hence the best procedure is to fill up the incubators gradually as the season progresses. By doing this, there is a continuous flow of chickens through the brooders, whereas if the brooding equipment is filled to capacity each time, there are breaks of four to six weeks in the ages of the chickens throughout the season.

It will be found that any disadvantage in respect of increased cost of running the brooders would be offset by the better quality of the chickens raised where they are run through gradually, due to the smaller number of better-class birds used for breeding.



Hawkesbury Agricultural College Single Testing Pens.

Selecting Breeding Stock.

Those who carry out their own breeding and hatching operations should undertake the selection of the breeding birds as early as possible this month, so that the birds will be settled down in the pens before the season starts.

In selecting birds for the breeding pens, the aim should be to pick only the best of the flock and not mate up unduly large numbers. It should be realised that, even among the best flocks, the number of birds really suitable for breeders is not likely to be more than 33 per cent., and in most instances in which a larger proportion is used it follows that inferior birds will be included.

This is the case on farms where the practice is made of hatching large numbers of

Restrict Flock Matings.

Although it is difficult to avoid the use of some flock matings where large scale breeding operations are carried out, the aim should be to provide for as many single breeding pens as possible. It cannot be expected that uniformity, either in the type of birds produced or production, can be obtained from flock matings, and it is essential, where pedigree breeding or progeny testing is carried out, that single breeding pens be provided. As far as possible, the stock bred from the single breeding pens should be used for breeding rather than birds from flock matings.

In adopting single pen matings, it is usual to allow ten to twelve females to one male in the case of light breeds, and eight to ten

to a male in the heavy breeds, depending upon the vigour and the condition of the male bird. It is not wise to have larger numbers than these, as poor hatchability is likely to result, particularly towards the end of the season.

Plan the Breeding Operations.

Every breeder should commence the hatching season with a definite plan of operations, so that throughout the season the number of chickens hatched can be co-ordinated with the brooder capacity.

It is first necessary to estimate the number of breeding birds required to produce the desired numbers of chickens. This particularly applies to those who wish to concentrate upon selecting the best breeding stock; otherwise the difficulty could be overcome by mating up an excess number of breeders and only using the number of eggs required.

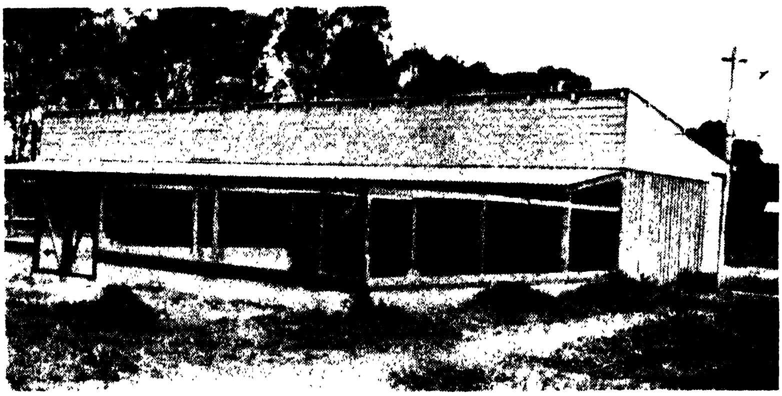
Number of Breeding Birds Required.

Those who spread hatching operations over the season, 1st June to the end of September, will find that about seventy to eighty pullets and hens are required to produce each 1,000 chickens, but, in cases where hens only are used, it would be necessary to allow at least 100 for each 1,000 chickens.

Where it is necessary to hatch out larger batches at one time, the numbers of breeders would have to be estimated according to the numbers of chickens required, and can be calculated as under:—

If hens only were used at least 500 selected birds are required to produce 100 eggs per day during June.

In July and August, approximately 300 birds should produce the same number of eggs.



The New Brooder House at Hawkesbury Agricultural College.

Chicken Weaning Pens at Hawkesbury Agricultural College.

In September, a lesser number would be required, but as the last chickens should be hatched by the end of September the setting would have to be completed by the first week in that month.

Brooder Capacity.

Calculation of the brooder capacity required should be based on keeping

the chickens in the brooder up to six weeks of age, and on the fact that most brooders are sold on their day-old chick capacity, which means that only about half the number of chickens can be placed in them if the chickens are kept for six weeks under heat. Although some farmers transfer the chickens to cold brooders at four weeks, it will be found that the most uniform results are obtained by keeping them in the heated brooder for six weeks.

The brooder accommodation required will vary according to whether the rearing operations are gradually spread over the season or whether one or two batches only are raised. In the former case, each 1,000 chickens to be handled would require brooder capacity of 500 day-old chick size, whereas to raise 1,000 chickens in two lots would require brooders having a total capacity of 1,000 and to handle 1,000 chickens in one lot requires brooder capacity of 2,000 chickens.

Other Rearing Accommodation.

The subsequent accommodation required for rearing chickens to productive age will vary similarly, according to whether small or large numbers of chickens are to be put through at the one time—and this is a consideration in making preparations for the rearing season.

Pedigree Marking.

Any farmer carrying out breeding operations should adopt a system of marking the progeny of the different pens, and this is, of course, essential where progeny testing is undertaken.

Where the number of markings required does not exceed sixteen, the most satisfactory method is web-punching, if carried out by the use of a red-hot needle. If done by a mechanical punch, the holes frequently grow over and the marking is lost, but where the holes are seared with a hot needle, the marking is permanent.

The most satisfactory device for searing the holes in the web is an electric needle, made by using a transformer to reduce the ordinary electric current to 6 volts. Such appliances were on the market prior to the war, and it is probable that they will be available again later.

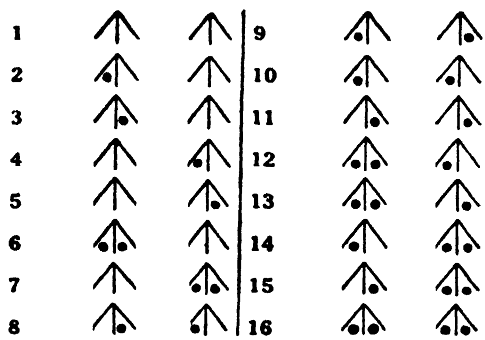


Chart Indicating Web Punching Marks.

The best alternative is to use two or three needles heated in turn on a primus stove. The main requirement is that the needle shall be red-hot, so as to puncture the web without any pressure. A large darning needle or pointed steel wire about the thickness of a hat pin is suitable for the purpose. The eye end of the needle should be inserted in a piece of cork for handling. A steady hand is necessary, as the slightest movement may result in the web being broken through, but this need not cause any concern as the mark will always be apparent.

The accompanying chart shows the various marks which may be effected by web-punching.

Apiary Notes—*continued from page 214.*

Department for examination should be addressed to the Chief, Division of Animal Industry, Department of Agriculture, Box 36A, G.P.O., Sydney. The letter advising despatch should be similarly addressed. The name of the contents and the name and address of the sender should be written on the outside of the package, and in special circumstances it may be advisable to forward samples by registered mail.

When samples are packed in a tin container, a few small holes should be punched through the tin. This ensures some circulation of air and escape of moisture, thus minimising the development of moulds and yeasts, which interfere with microscopical examination.

Instructions for Washing and Care of Milking Machines.

CONTRIBUTED BY DIVISION OF DAIRYING.

THESE instructions have been drawn up in collaboration with the Milking Machine Section of the New South Wales Farm Machinery Manufacturers' and Distributors' Association.

Operations to be Performed Twice Daily.

1. As soon as milking is finished wash the outside of teat cups, claws and rubbers, with a brush in luke warm water which contains some suitable water-softening compound.

2. While the plant is still running, commencing with the unit furthest from the *RELEASER*, dip the cups in a bucket of clean, warm water moving them up and down a few times to admit water and air alternately. The temperature of this water should be approximately blood heat, *i.e.*, 100 deg. Fah. *DRAW NOT LESS THAN ONE GALLON THROUGH EACH UNIT.*

3. Remove the plug at the end of the line and draw the milk brush, or ball of horse-hair, through three (3) times.

4. Draw not less than *ONE GALLON* of boiling caustic solution through each unit (one dessertspoonful of caustic soda to four (4) gallons of water is the strength recommended). This operation should alternate air and water, as in Item No. 2, to create a surging effect.

5. Repeat Operation No. 3.

6. Draw one (1) gallon of clean, boiling water through each unit. *BE SURE IT IS BOILING.*

7. Stop the plant. Remove the cup assemblies at the down drops and hang on hooks in the Separator Room. Remove metal caps from the end of claw tubes. The heat of the scald quickly dries the parts and in addition when hung up the tubes will be in a vertical position allowing an air draught to circulate.

8. Remove, clean, and scald releaser and vacuum tank. The rubber tube connecting the pulsator and releaser should be included in this operation.

9. Open all taps and remove all plugs, etc., so that fresh air will circulate through the system.

Operations to be Performed Once Daily.

10. Flush out the pulsator line. In performing this operation take care to fix the pulsator slides in the position which will eliminate the risk of water getting down behind the inflations.

11. The section of pipes between the releaser and vacuum tank, and the vacuum tank and pump, should be inspected and, when necessary, they should be dismantled and cleaned.

Operations to be Performed Weekly.

12. Completely dismantle the cup assemblies and wash thoroughly with brushes in a cleaning solution, paying special attention to rubbers.

13. Place all rubber parts in a clean sugar bag and immerse in boiling caustic solution (one (1) dessertspoonful of caustic to four (4) gallons of water) for 4 or 5 minutes.

14. Finally boil the rubbers in clean water for a few minutes.

General.

Air admission holes in the end of claws should be kept open and free from dirt.

Keep all driving belts reasonably tight, *i.e.*, take up stretch when necessary.

By experience it has been found that inflations last longer if they are "stored" for short intervals. The method recommended for "storing" inflations is to place them in a dark, air-tight container after they have been thoroughly cleansed and dried in accordance with directions Nos. 12, 13 and 14.

New inflations should be subject to treatment by boiling, as recommended in directions Nos. 13 and 14.

The use of a small steam boiler for heating water and generating steam greatly facilitates the work of maintaining milking machines in a thoroughly clean condition.

(Continued on page 224.)

FEEDING STALLS FOR DAIRY COWS.

Working Plans and Lists of Materials

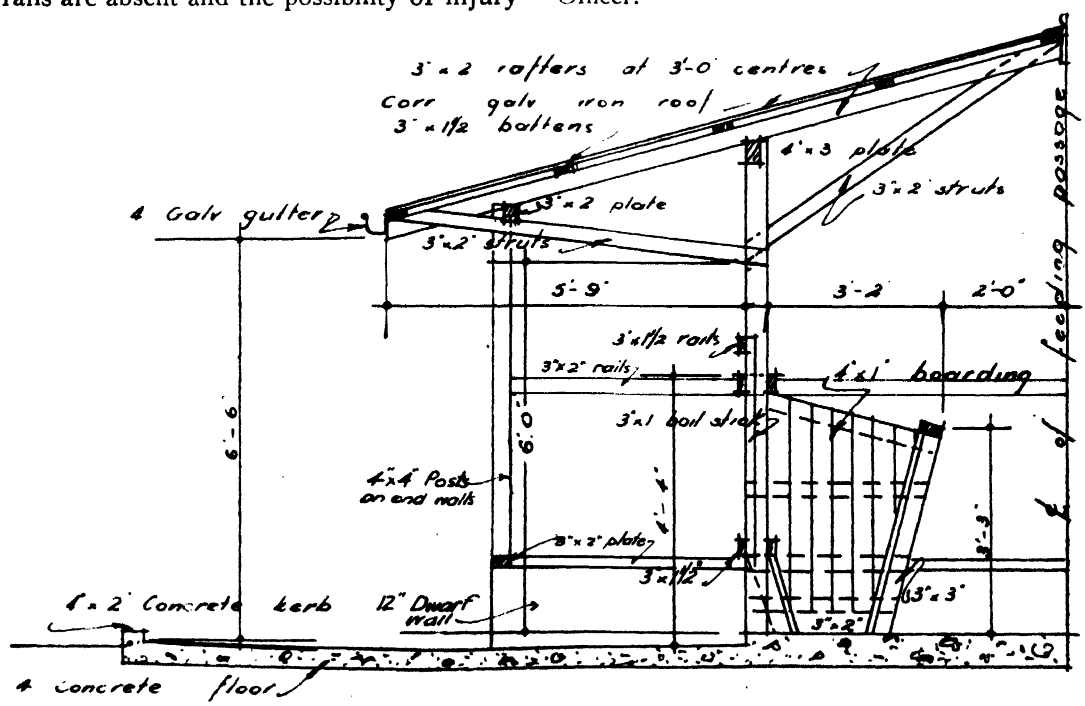
Available from the Department.

UNDER New South Wales dairying conditions it is advisable to stall-feed the milking herd at some period or periods of the year. During winter months and during the frequent dry spells which occur, grazing is often insufficient to keep the herd producing at a satisfactory level, and at such times supplementary feeding should be practised.

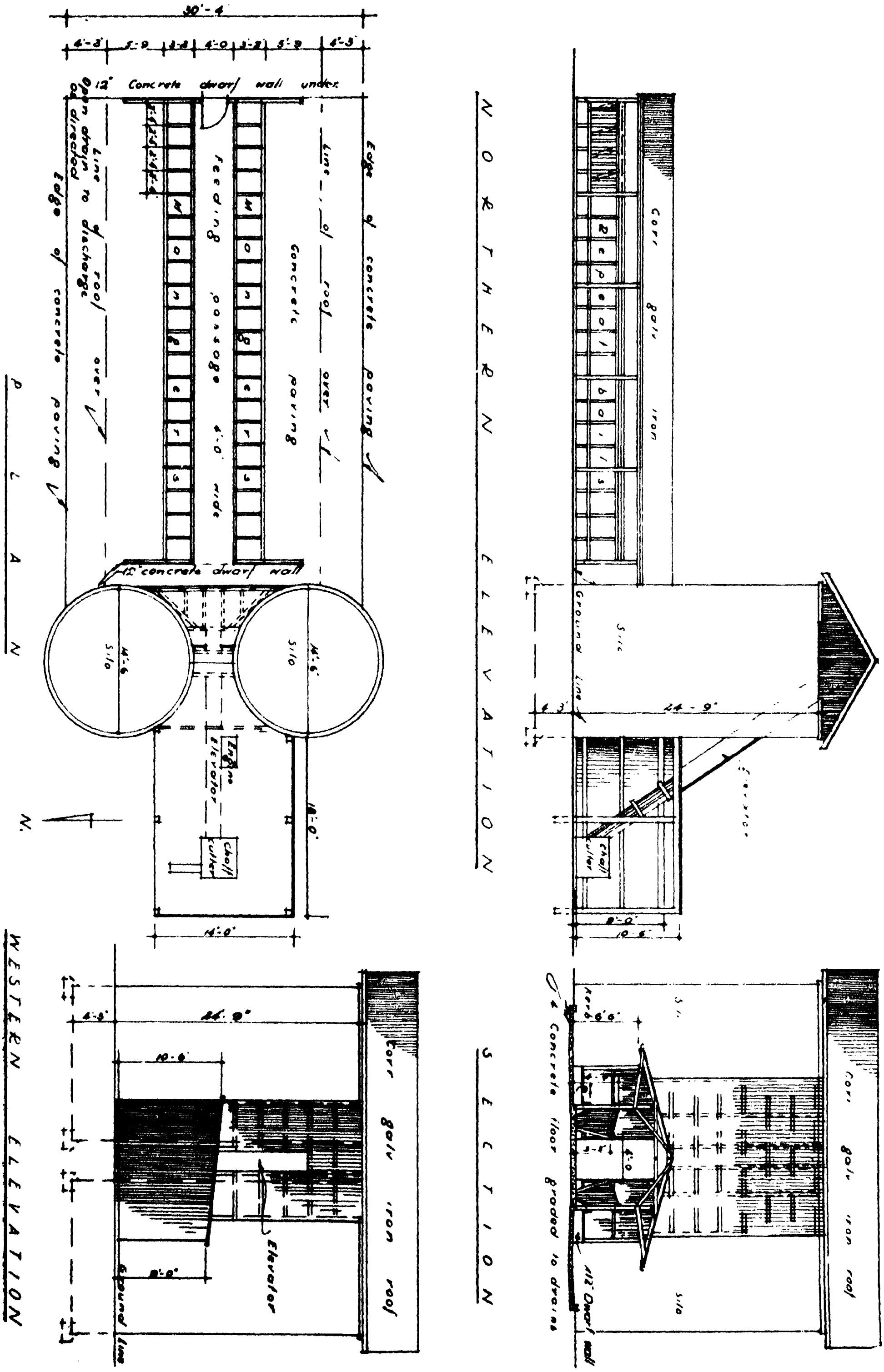
In recent years we have seen the demand for milk products increase. The most notable increase in demand has been for liquid milk. To maintain this market, which is the most remunerative, it is essential that milk production be maintained during the cold months of winter and the dry spells of summer. To assist dairymen in providing suitable facilities for supplementary feeding, plans and lists of materials necessary to construct suitable buildings have been prepared.

The design is mainly based on the stalls in use on Camden Park Estate and they combine economy in construction and efficiency in working. It will be noted that division rails between the cows have been eliminated, thus reducing the cost. It has been found in practice that they serve no useful purpose; in fact when the twenty cows which are bailed up on one side are simultaneously released, they have more space in which to move when the division rails are absent and the possibility of injury through jostling is appreciably reduced. The size and construction of the mangers are such as to reduce waste and injury by horning to a minimum.

These working drawings and lists of quantities of materials are available, free of cost, to dairymen requiring them. Applications should be made to the Division of Dairying, Department of Agriculture, Box 36A, G.P.O., Sydney, or the District Dairy Officer.



Section through Feeding Stalls.



Feeding Stalls with Head Bailing and Double Silo.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingah.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingah State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

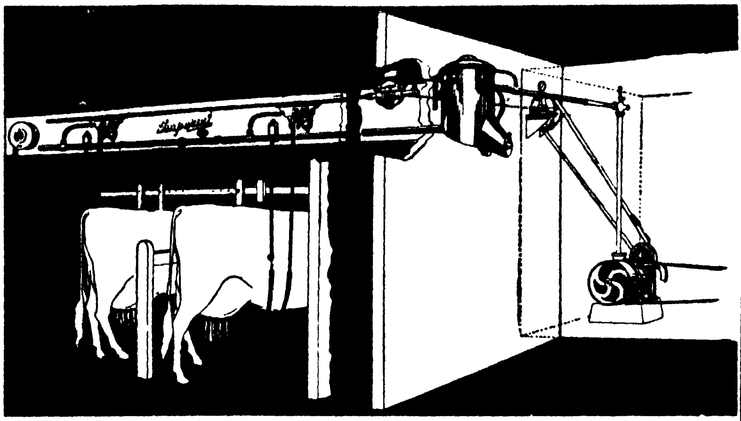
114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.

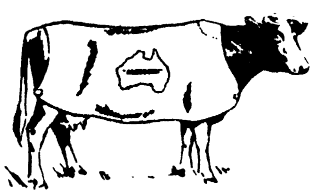
Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., "Elwatan," Castle Hill (Jerseys) ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hann, O., "Bomerah," Barrington (Jerseys)	55
Hawkesbury Agricultural College, Richmond (Jerseys)...	96
Hicks Bros., "Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys) ...	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)...	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	135
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	90
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	150
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	155
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Yanco Agricultural High School	64
Young, A., "Rocklynne," Cudal (Polled Beef Shorthorns)	27
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	47
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	9
Morisset Mental Hospital	66
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	72
Reid, D. B., "Evandale," Sutton Forrest	24
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.





Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	29	5/3/47
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	119	19/3/47
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys)	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station	19	29/4/47
White, H. F. Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys)	110	16/3/47
Yanco Agricultural High School, Yanco	64	1/3/47
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	23	25/2/47

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	52	26/6/47
Aboriginal Station, Wallaga Lake	19	29/4/47
Australian Missionary College, Cooranbong	100	30/8/47
Barnardo Farm School, Mowbray Park	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell	21	8/6/47
Department of Education, Gosford Farm Home	37	26/2/47
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	115	29/1/47
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood	23	29/4/47
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	80	4/2/49
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
Marist Bros. College, Campbelltown	70	3/1/48
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville	21	8/8/46
New England University College, Armidale	19	1/5/47
O'Brien, O. "Mount View," Inverell	18	9/2/47
Orange Mental Hospital	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree	53	1/2/47
The Sydney Church of England Grammar School, Moss Vale	48	18/12/47
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., "Blytheswood," Exeter	66	23/4/47
Youth Welfare Association of Australia	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Washing Milking Machines—*continued from page 219.*

An ample supply of boiling water for washing milking machines is a vital factor in their successful maintenance.

Machines should be oiled and greased in accordance with instructions issued by the makers.

Brushes and horse-hair used in cleaning operations should be maintained in a sanitary condition by adequate boiling.

The milking machine should be operated on the lowest vacuum which will achieve the milking operation, but it should not exceed 15 inches.

Pamphlets on Quality in Cream.

THERE is always a cause of inferior quality in cream—sometimes easy to find, at other times more obscure, but in few cases is it impossible to discover the reason for it.

Contrary to the belief of some farmers, the factory grader does not class cream as "second quality" if it can possibly be avoided. Dairymen may rest assured that the cream grader at the factory is able to differentiate between good and bad cream, and that when a can of cream is graded second quality it has a taint of some description which warrants the classification. The trouble may be looked for at some point between the cow and the factory, and in most instances it is not very difficult to trace.

Very often "second quality" cream is supplied simply because the fundamental principles governing the development of flavours in cream are not understood. Informative pamphlets on this subject are obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Pasture Improvement—The Methods Employed.

THE following methods of improvement of pastures have been used on a commercial scale in various parts of the State with good results:—

(1) Ploughing and working down the land and sowing mixtures of grasses for permanent pasture. This method has been found very successful in the tablelands and coastal areas, and, with modifications to suit local conditions, in the wheat districts. A fine seed-bed should be prepared and weed growth controlled whilst the land is in fallow. If the resultant pasture is free from weeds it will provide more feed and be more permanent.

(2) Broadcasting grass and clover seed on the pasture and providing cover for the seed by harrowing. This operation may be carried out during top-dressing by mixing the seed with the fertiliser. Free germinating seeds, such as perennial rye grass, Wimmera rye grass, sheep's burnet and Subterranean clover, can be readily established by this method under favourable conditions of soil and climate.

(3) Distributing seeds of suitable grasses and clovers round fallen timber, dug-out rabbit burrows, or any other place providing cover for the seeds.

(4) Allowing native grass or saltbush areas to form seed periodically, resulting in the thickening up of the pasture.

More detailed information on the above mentioned methods is given in the departmental pamphlet, "Methods of Establishing Improved Pastures," which is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

THE AGRICULTURAL GAZETTE FOR MAY, 1947.

This Issue Contains:—

The Agricultural Gazette.

MAY, 1947.

A Pattern for Rural Electrification.

U.S.A.'s Rural Electrification Administration (R.E.A.) was set up about twelve years ago as an agency in the U.S.A. Department of Agriculture to carry out a total rural electrification programme.

When R.E.A. came into being in 1935, only 11 per cent. of all farms in U.S.A. were connected to power lines. By July, 1946, 3,106,755 farms (53 per cent.) were connected, and latest estimate by Rural Electrification Administrator, Claude R. Wickard, claims that all farms in U.S.A. will be served within the next three to five years.

Loans approved by R.E.A. for electrification of American farms now total 1,000,000,000 dollars. These loans cover full costs of constructing new power facilities. No grants are made. The loans bear 2 per cent. interest and are repayable over a maximum period of thirty-five years.

Loans have been made to 1,011 borrowers, including 971 co-operatives, 40 public power districts, 20 other public bodies and 20 power companies. R.E.A.-financed co-operatives are locally owned and controlled by boards of directors elected annually by and from consumer members. They are independent, tax-paying business entities.

Of the 1,000,000,000 dollars in loans approved by R.E.A., 89 per cent. has been for electric distribution systems, 9.6 per cent. for generation and transmission facilities, and 1.4 per cent. to finance wiring and plumbing in homes of consumers, and electrically operated appliances and equipment.

R.E.A. borrowers averaged 21,000 new consumers a month in the last half of 1946, and the rate is now about 25,000 a month. This is fast progress, but R.E.A. officials predict that, as materials become more rapidly available, line construction will proceed at an increasingly rapid rate.

Apart from supplying amenities for improvement of rural living conditions, rural electrification has brought about outstanding progress and change in the agricultural industries of U.S.A.

For example, farmers in an area in Georgia shifted from cotton growing to more lucrative chicken raising after the R.E.A.-financed co-operative line provided electricity to operate chicken brooders, water pumps and other time- and labour-saving devices.

In Morgan County, Colorado, an R.E.A.-financed co-operative made electricity available to pump irrigation water from an underground river for farms in a thinly settled farming area with an uncertain crop yield. Since then, the area has been transformed into a well populated and highly productive irrigation farming centre.

In one section of North Dakota, co-operative loans made it possible for farmers to use electric power to operate such labour-saving devices as water systems, milking machines, feed grinders and chicken brooders. Subsequently the number of dairy cows on farms in that area increased 50 per cent., pigs 100 per cent., and chickens 300 per cent.

Obituary.

A. W. S. Moodie.

Mr. A. W. S. MOODIE, Chief of the Division of Plant Industry of the Department of Agriculture, died suddenly on 26th April, at the age of 47 years.

Readers will join with officers of the Department in expressions of sorrow and in extending sympathy to his family and other relatives in their sad loss.

Few officers had a wider experience of the problems of primary producers and of conditions prevailing throughout rural New South Wales than the late Mr. Moodie. He joined the Department in 1920 as Assistant Agrostologist after graduating from Hawkesbury Agricultural College with diplomas in Agriculture and Dairying.

As Senior Agrostologist, he contributed to the excellent work which has been done on pasture improvement in this State, and was primarily responsible for framing the provisions of the Agricultural Holdings Act, designed to rectify the unsatisfactory position of rural tenancy.

In 1944 Mr. Moodie became Chief Instructor of Agriculture, in which capacity he directed the activities of some thirty field instructors. During most of the war years he was in charge of rationing of fertilisers in New South Wales and at the time of his death, in addition to his duties as Chief of the Division of Plant Industry, he was acting for the Commonwealth Government as Deputy Co-ordinator of Rural Training, being responsible for the training of ex-servicemen in New South Wales.

Throughout the twenty-seven years of his service in the Department, Mr. Moodie held the respect and esteem of all officers and of primary producers with whom his work brought him in contact. His loss is one that will long be felt both by the Department and by the farmers of this country.

Free Leaflet on Poisoning Green Timber.

THE autumn is the best time to poison green timber with arsenic compounds. If the operation is carried out when the sap flow in the tree is ceasing, suckering will be reduced to a minimum. A free leaflet on the process is obtainable from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Heavy Growth of Soybeans on the North Coast.

SOYBEANS.

W. D. KERLE, H.D.A. Special Agronomist.

APART from the value of the soybean plant as a fodder, the manifold uses of its grain vary from food for humans and livestock to many industrial uses. Soybean oil is used extensively for paints and varnishes. It is also used for making soap, candles, glycerin, linoleum, celluloid, lecithin, printing ink, adhesives, rubber substitutes, cosmetics, etc. Plastics developed from soybean meal are being used in the manufacture of car bodies, car parts and for many articles in commerce. From soybean protein a fibre has been made which resembles scoured wool.

Soybeans as human food have many uses. The mature bean is used extensively for human consumption as an haricot bean, canned or as sprouts. Soybean oil is used as a salad oil, also in making substitutes for products of animal fats, such as margarine. Soybean flour is used in bread and other foods for diabetics. Breakfast foods, macaroni, bean curd, soy sauce and soy milk are other popular products. The soybean is a valuable source of casein. Soybean milk can be used for practically all purposes for which cows' milk is used. Varieties of soybeans have been developed recently for use as a cooking vegetable.

The soybean (*Soja max (L) Piper*), often referred to as the soya bean, is a native of eastern Asia. It is a summer growing annual legume, erect growing and branching with pubescent, *i.e.*, hairy, leaves, stems and pods. There are many varieties, ranging in maturity from ten to thirty weeks, and seed colour varying from black to cream. The pods are comparatively small, usually containing two or three seeds. The leaves vary considerably in shape, size and colour, and as the pods ripen the leaves turn yellow and have fallen by the time the seed is mature.

World Distribution.

Soybeans have been cultivated as a staple food product in Eastern countries for hundreds of years. They were first recorded in Chinese literature 5,000 years ago. China and Manchuria still lead the world in production and for many years were followed by Japan and Korea.

In the last decade, however, owing to the amazing number of industrial uses developed in U.S.A., the acreage has increased enormously in that country, which now occupies third place in world production.

European countries also have in recent years greatly increased their acreage—chiefly in Rumania, Czechoslovakia and Russia.

The extraordinary development of the soybean industry in U.S.A. in recent years has focussed attention of other countries on the possibilities of the crop. This is particularly so in Australia and South Africa.

It is not a new crop to Australia, having been introduced many years ago and grown experimentally in many districts. In America it was first grown nearly 150 years ago, but very little use was made of it until its value as a hay crop, where other legumes did not thrive, was discovered. It is only since 1932 that the production for grain has increased phenomenally, from less than 15,000,000 bushels in that year to 210,000,000 bushels in 1942 from about 11,000,000 acres. This increase has been due to the increasing demand for oil, and to price factors in comparison with crops such as maize and wheat, but it has only been possible because American plant breeders have during the last twenty-five years evolved, by introduction and selection, varieties for production of grain suited to the huge maize-producing centres of the States.

America's large population and cold winter climate and her heavy industrialisation create very large demands for oil for edible and industrial uses. Despite her varied climate and good agricultural resources, America has never found it possible to meet these demands from her own production. In recent years, and particularly during the war when imports of oilstuffs were drastically reduced, the need for greatly increased production of these oils brought about a rapid increase in soybeans, which have a relatively good content of oil which lends itself to both edible and industrial uses.

By reason of her relatively small population and mild winter climate, the ample production of dairy products largely takes care of Australia's edible oil requirements, and cheaply imported linseed and copra largely supply the industrial oil requirements. The chief industrial oil requirement is for paint manufacture, and linseed oil is greatly superior to soybean oil for this purpose.

Soybeans in Early Stages of Growth.

Experience in New South Wales.

Experience with soybeans in this State extends over the last thirty years. During that period the Department of Agriculture has given close and specialised attention to the crop. Some hundreds of varieties have been imported from the East, U.S.A., and other countries, and field experiments have been carried out in all districts in the State. Numerous experiments have been conducted at Hawkesbury Agricultural College and Experiment Farms with varieties, cultural practices, fertilisers, seed inoculation, etc. As a result of these trials, several varieties are now recommended, and the Northern Tableland has shown to be the district best

suited to grain production. It is interesting to note that the best variety is one imported from South Africa, and is a selection from one outstanding plant of a Chinese variety out of 400 varieties imported into South Africa from all parts of the world in 1925, and grown at Potchefstroom College of Agriculture.

Although the Northern Tablelands have given the best results, the yields have not been sufficient to recommend them as a commercial crop. The average yield over a ten year period has been approximately seven bushels per acre. Yields of over twenty bushels per acre, however, have been obtained at variety trials. Although during the war the price, for a very limited production, was as high as 42s. per bushel, and contracts were let at 25s. by the Commonwealth Government in 1942-43, they were imported before the war from China and the Netherlands East Indies at about 6s. per bushel. It is obvious that on present yields the crop grown for grain could not possibly compete with maize or other summer crops, even if the pre-war import price was doubled.

The Department of Agriculture is endeavouring to improve the yield of soybeans by breeding, selection and trials of imported varieties. The Commonwealth Government, in an effort to establish the industry, imported from the U.S.A. in the 1946-47 season, seed of three varieties sufficient to sow 2,200 acres.

It is interesting to note that the experience of New South Wales in the establishment of commercial production of soybeans is similar to that in all other States of the Commonwealth and New Zealand—Queensland probably showing the best promise of success.

Soil and Climatic Requirements.

The best results are obtained with soybeans on fertile loam or sandy loam soils, but they are satisfactory on nearly all soil types provided they are well drained. Heavy black or red soils are liable to cause staining of the grain in the light coloured canning varieties if wet weather is experienced at harvest. In these soils, particles of soil, approximately the same size as the beans, often make grading difficult without special machinery. Soybeans will do well in soil suitable for maize, but will grow better than maize on soils low in fertility, provided inoculating organisms are present.

As regards climate, soybeans are susceptible to frost and must not be sown until danger of frost is over and there is some warmth in the soil. They are peculiarly sensitive to changes of climate. It appears that the flowering stage is a very critical period with soybeans. Failure to set seed regularly every year has been the most noticeable feature of soybean growing in

Soybean Roots Showing Well-developed Nodules after Seed Inoculation.

some districts of the State. Hot weather, with dry atmospheric conditions at flowering time on the Central Tablelands, in inland districts and on the Murrumbidgee Irrigation Area, has resulted in almost complete failure to set seed; while in coastal districts, wet, humid weather at this period has had the same result. It is due to the fact that on the Northern Tablelands there is seldom any appreciable failure to set seed due to climatic factors that soybeans have given the best results in that area.

Soybeans are most likely to succeed in districts with an annual rainfall of 25-35 inches.

Soil Preparation.

Soybeans respond to good soil preparation. Early ploughing is desirable, followed by cultivations to destroy weed growth and to make a firm seed bed with a loose surface. A light harrowing prior to sowing will break up clods, destroy young weed growth and ensure a uniform depth of sowing. This will give the young plants, which are slow in the initiail stages of growth, a better chance to become well established.

Mature Plant of Potchefstroom 169.

Time and Methods of Sowing.

Sowing can be done from September to December in coastal districts, and from mid-October to early December in tableland districts. In the warmer and drier districts, sowing should be made to avoid flowering in midsummer when seed setting may be adversely affected if hot winds are experienced. Germination and growth are generally poor in cold or wet soil. The seed should not be sown deeply, a depth of one to three inches being desirable according to the nature of the soil—the deeper sowing on the lighter soil types. Consideration should be given to sowing so that the crop will mature when good weather might be expected to facilitate harvesting and avoid mouldiness in the grain. In inland districts, sowing should be regulated so that the flowering period will not coincide with the hottest summer period.

Soybeans should be sown in rows 28 to 36 inches apart, allowing 4 to 6 inches between plants. Width of rows is largely determined by the growth habit of the variety. Sowing through every run of the drill is practised to some extent in the U.S.A. For this method the ground has to be free of weeds. Row sowing is recommended in preference under our conditions. Row sowing requires considerably less seed per acre than broadcasting or solid drilling; it gives a more uniform stand and permits inter-row cultivations. Seed can be sown with the maize drill or the oats side of the combine by blocking up some of the runs. It will take about 40 lb. of seed of varieties such as Potchefstroom 169 and Lincoln to sow an acre with rows 28 inches apart. Soybean seed loses its germinating capacity quickly, particularly if stored in warm, moist climates. It is advisable to sow seed of not more than the two previous seasons' harvest, if possible.

Hares and rabbits have a particular liking for soybeans, and where these pests are prevalent, the area must be securely netted before sowing.

Fertilisers.

If soybeans are grown on good maize land, only a light application of superphosphate, ½ to 1 cwt. per acre, is required. In tableland areas this application is recommended also. Low fertility soils will require a complete fertiliser at 1½ to 2 cwt. per acre, and an application of lime to acid soils will stimulate the production of bacteria nodules on the roots and increase yields. Nitrogenous fertilisers are not necessary on most soils, as soybeans, being a leguminous crop, obtain their nitrogen from the air if bacteria nodules are abundant on the roots.

Inoculation of Seed.

Where soybeans are being sown in land which has not grown the crop previously, inoculation of the seed is desirable. Cultures are procurable on application to the Biological Branch, Department of Agriculture, Sydney, at a cost of 2s. 6d. each, sufficient to treat one bushel of seed. Instructions for treating the seed are supplied with the inoculum and should be carefully followed. The presence of bacteria is indicated by the

development of nodules on the roots. The soybean is able to utilise the nitrogen of the air through the action of these organisms.

Varieties.

There are hundreds of varieties of soybeans, varying considerably in maturity, habit of growth and colour of seed. There are varieties suitable chiefly for fodder and green manuring, for grain only, for the dual purpose of fodder and grain, and vegetable types for home cooking. The grain varies in oil content also, hence some are better adapted than others for this purpose. The cream coloured varieties are most suitable for canning and general edible use.

There are, however, only a very limited number of varieties available in this State. They are as follows:—

Potchefstroom 169.—A dual purpose variety, originally from South Africa, which has given the highest yield of grain for some years. It is particularly valuable in that the seed does not shatter when mature. The grain is cream coloured and the hilum is the same colour. It is suitable for canning and all edible purposes. It is mid-season maturing in about 130 days. The oil content is 21 per cent.

Easy Cook.—Similar to the above in growth and seed colour, but shatters when mature. It does not yield as heavily as Potchefstroom 169 and is fast losing favour in consequence. It is one of the best varieties for use as a green vegetable. It matures in about 135 days. The oil content is 21.5 per cent. and protein 38.3 per cent.

Haberlandt.—This is an earlier maturing variety of the grain type, maturing in 125 days. It has yielded well consistently, particularly in the shorter season districts. It shatters badly when mature and loss in harvesting is inevitable. The grain is smaller than the above varieties, but similar in colour. The oil content is 19.15 per cent. and protein 41.73 per cent.

Otootan.—Suitable for green manuring or fodder in coastal districts. Grows rapidly under good conditions, but takes 145 days to mature. Seed is black in colour and not suitable for canning. The oil content is 16.4 per cent. and protein 45.6 per cent.

Lincoln.—This is the most widely grown variety in the U.S.A. It is a selection from a cross between Mandarin and Manchu. It is early maturing, of medium height, rather spreading habit of growth and well podded. The grain is medium sized, straw yellow in colour, with a dark brown hilum. The oil content is 21.4 per cent.

Dunfield.—An early maturing variety a fortnight earlier than Potchefstroom 169. Seed is straw yellow with light brown hilum. It has an upright, compact, fairly short habit of growth. The oil content is 20.78 and protein 39.69 per cent.

"Easy Cook" Soybeans.

Richland.—A purple flowered variety maturing earlier than Dunfield. Seed is straw yellow with light brown hilum. It has a fairly compact habit of growth similar to Haberlandt. The oil content is 19.6 per cent. and protein 35.4 per cent.

(*To be continued.*)

A Corner of the Department's Display at Sydney Royal Show.

A DECENTRALISED SERVICE

With State-wide Cover.

THE New South Wales Department of Agriculture is no city-bound organisation. Its field officers, experiment farms, orchards, nurseries, stud herds and flocks, and other centres of advice and assistance to primary producers cover the State.

What services those officers and institutes supply to farmers, how farmers can obtain those services, and striking evidence of their value, combined to supply a theme for the Department's display in the Agricultural Hall at the recent R.A.S. Sydney Show. Sections of that display are illustrated in this issue.

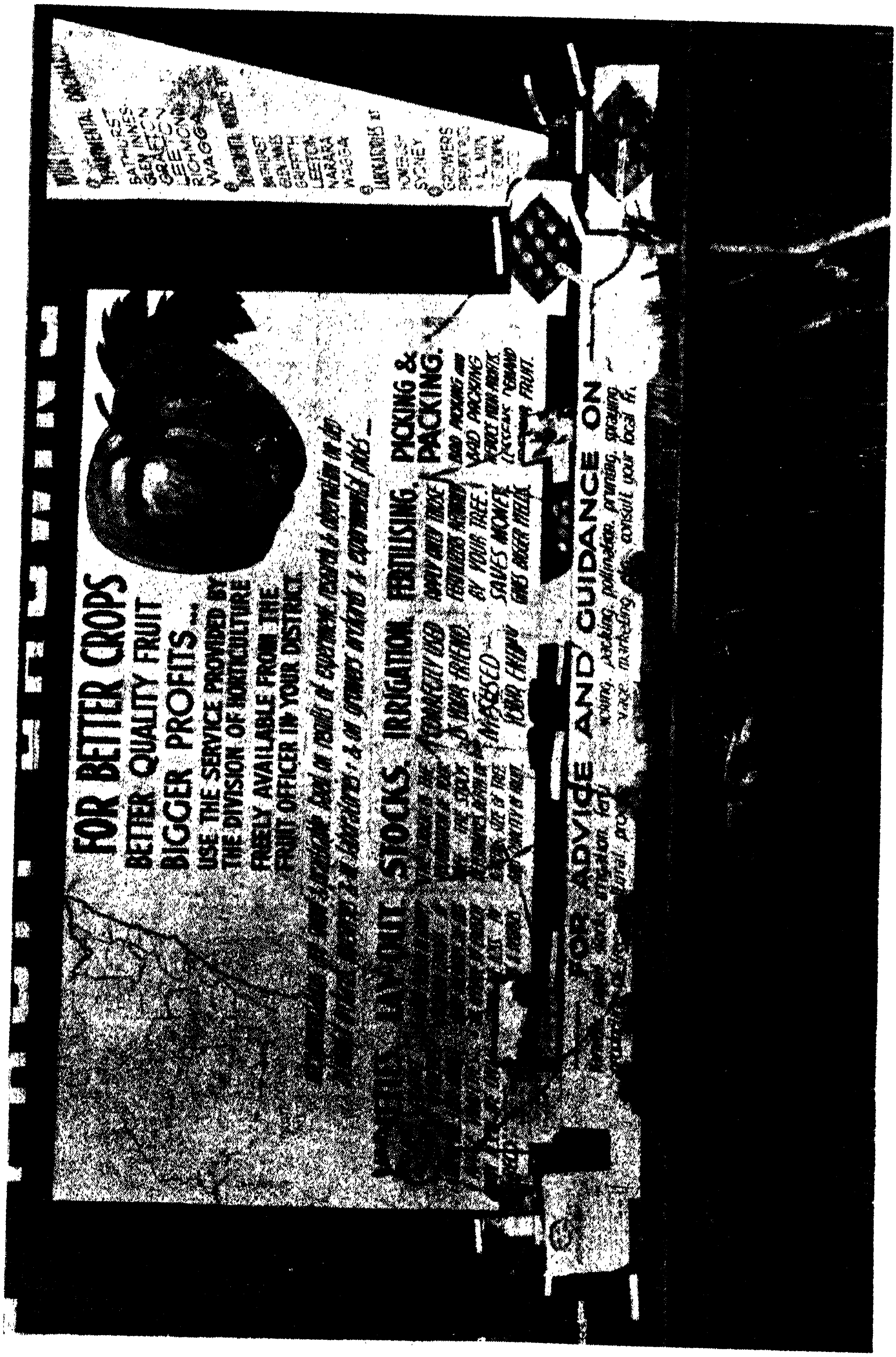
Each section of the Department was alloted a bay to display what it had to offer—Divisions of Animal Industry, Plant Industry, Dairying, Horticulture, Information and Extension Services, Marketing and Economics, and Science Services.

Officers were on duty to give advice both on the Department's activities and on opportunities offering in the various districts and industries so well advertised by the District Exhibits, also housed in the same hall.

Supporting folders were available so that show-goers might carry away, for future reference, a summary of the information which the show display aimed to give. Copies are still available free. They contain names and addresses of district officers and institutions which can help you (not merely at show time, but every day of the year) to make farming more efficient, less laborious and more profitable.

The Department's address is Box 36A, G.P.O., Sydney.

A Popular Show Feature—The Grand Parade.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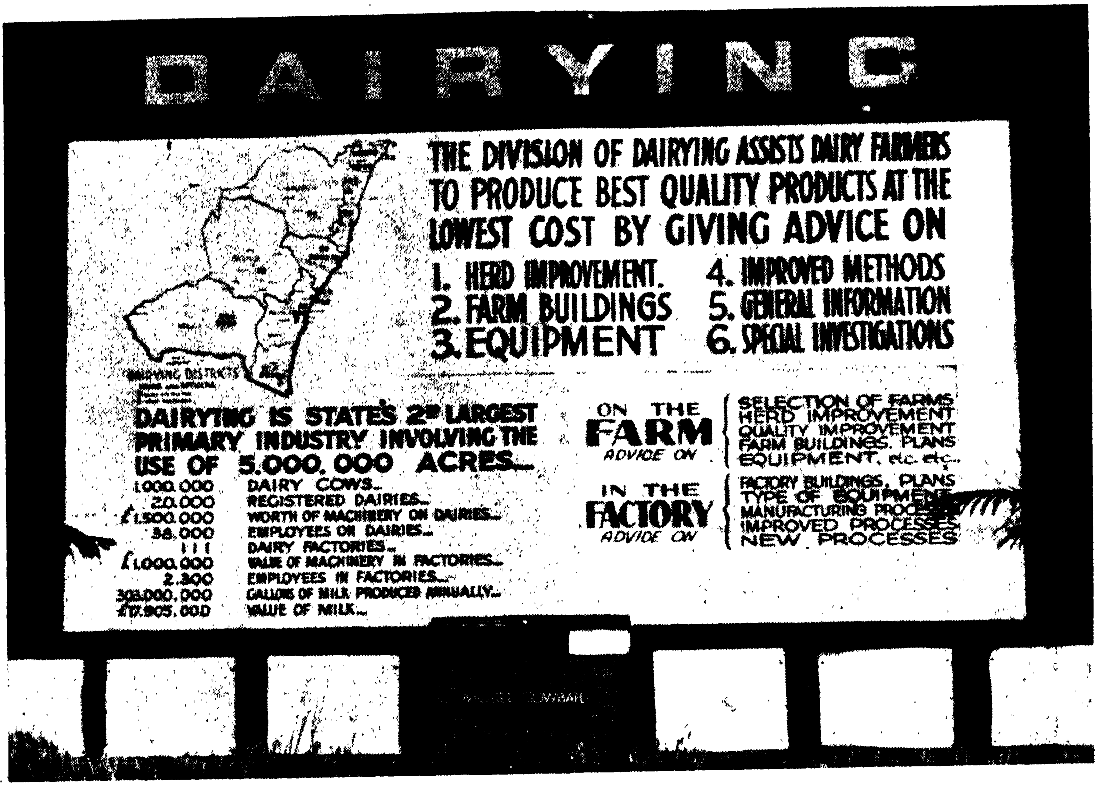
BETTER QUALITY FRUIT
BIGGER PROFITS...
USE THE SERVICE PROVIDED BY
THE DIVISION OF HORTICULTURE
FREELY AVAILABLE FROM THE
FRUIT OFFICER IN YOUR DISTRICT
STOCKS
IRRIGATION
FERTILISING
PICKING & PACKING
FOR ADVICE AND GUIDANCE ON


DAIRYING
THE DIVISION OF DAIRYING ASSISTS DAIRY FARMERS
TO PRODUCE BEST QUALITY PRODUCTS AT THE
LOWEST COST BY GIVING ADVICE ON
1. HERD IMPROVEMENT. 4. IMPROVED METHODS
2. FARM BUILDINGS 5. GENERAL INFORMATION
3. EQUIPMENT 6. SPECIAL INVESTIGATIONS
DAIRYING IS STATE'S 2nd LARGEST
PRIMARY INDUSTRY INVOLVING THE
USE OF 5.000.000 ACRES...
1.000.000 DAIRY COWS...
20.000 REGISTERED DAIRIES...
£1.500.000 WORTH OF MACHINERY ON DAIRIES...
38.000 EMPLOYEES ON DAIRIES...
111 DAIRY FACTORIES...
£1.000.000 VALUE OF MACHINERY IN FACTORIES...
2.300 EMPLOYEES IN FACTORIES...
303.000.000 GALLONS OF MILK PRODUCED ANNUALLY...
£17.905.000 VALUE OF MILK...
ON THE FARM ADVICE ON
SELECTION OF FARMS
HERD IMPROVEMENT
QUALITY IMPROVEMENT
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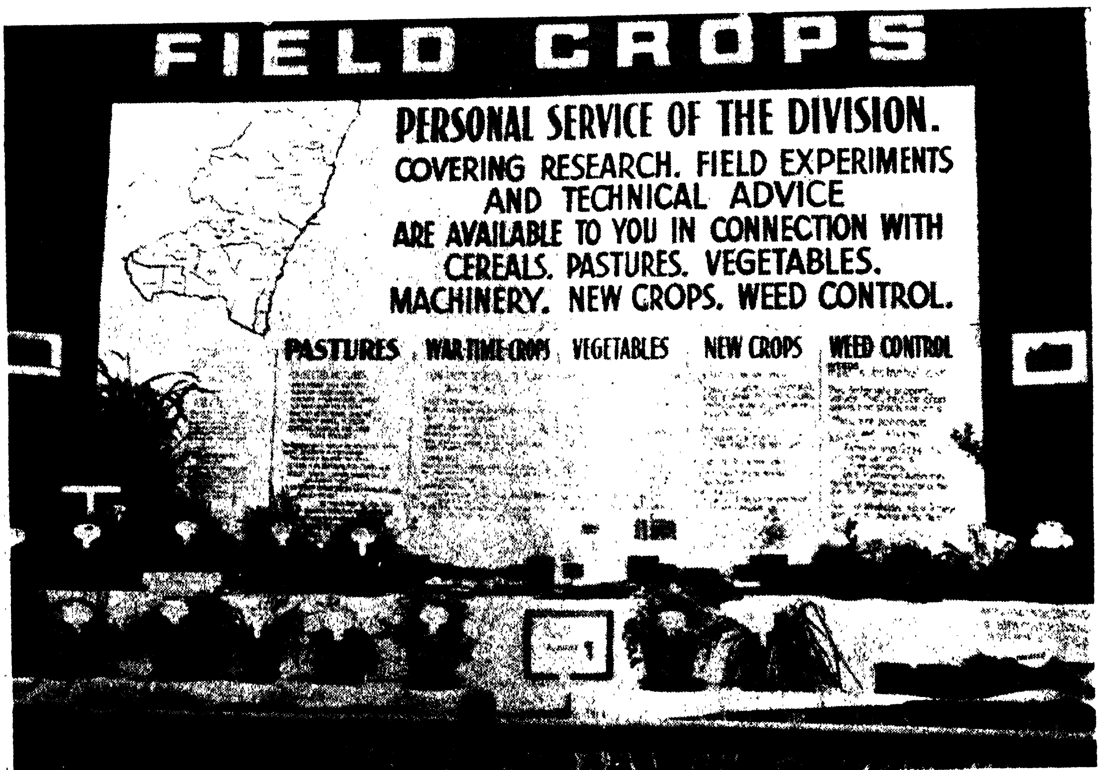
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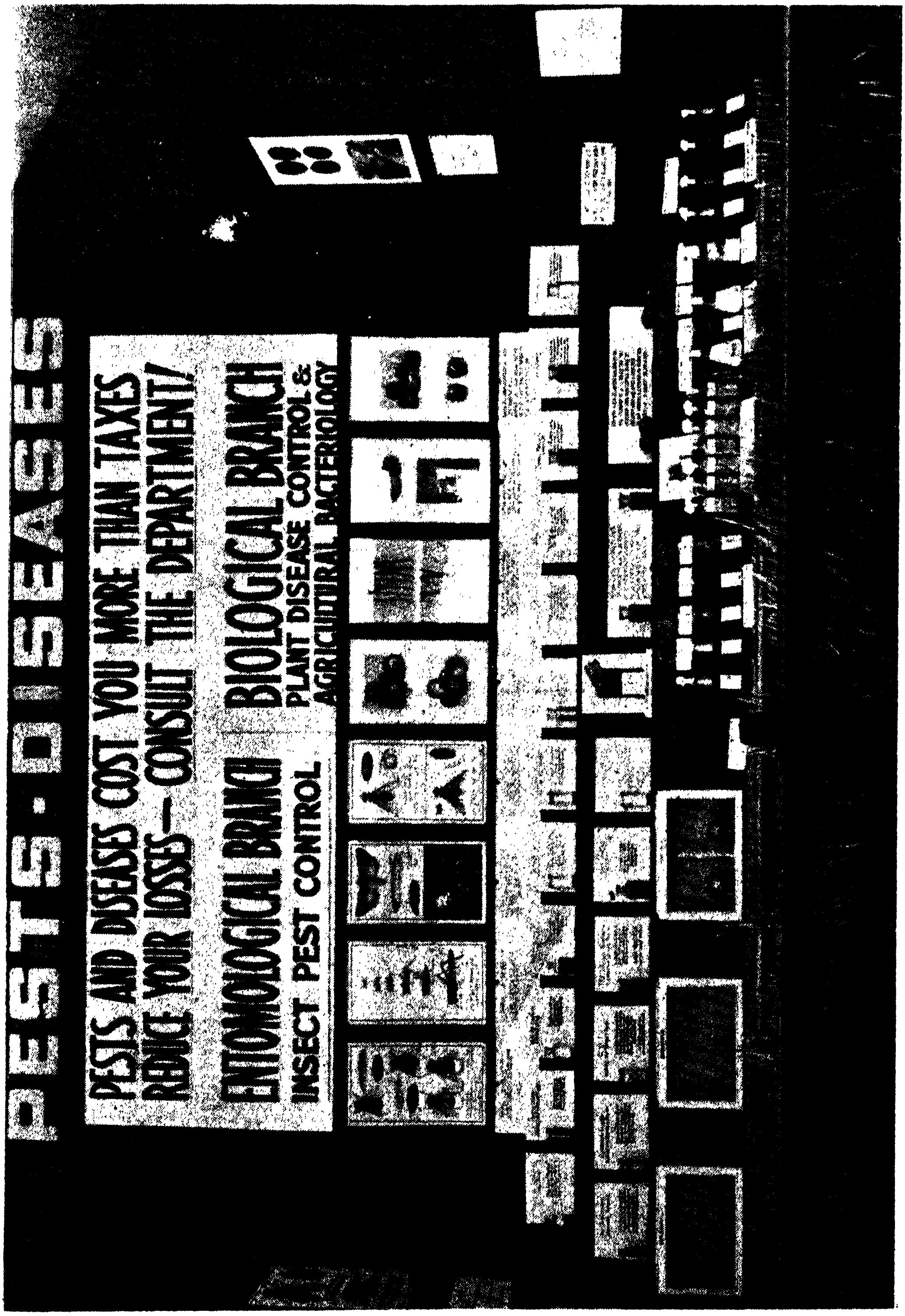
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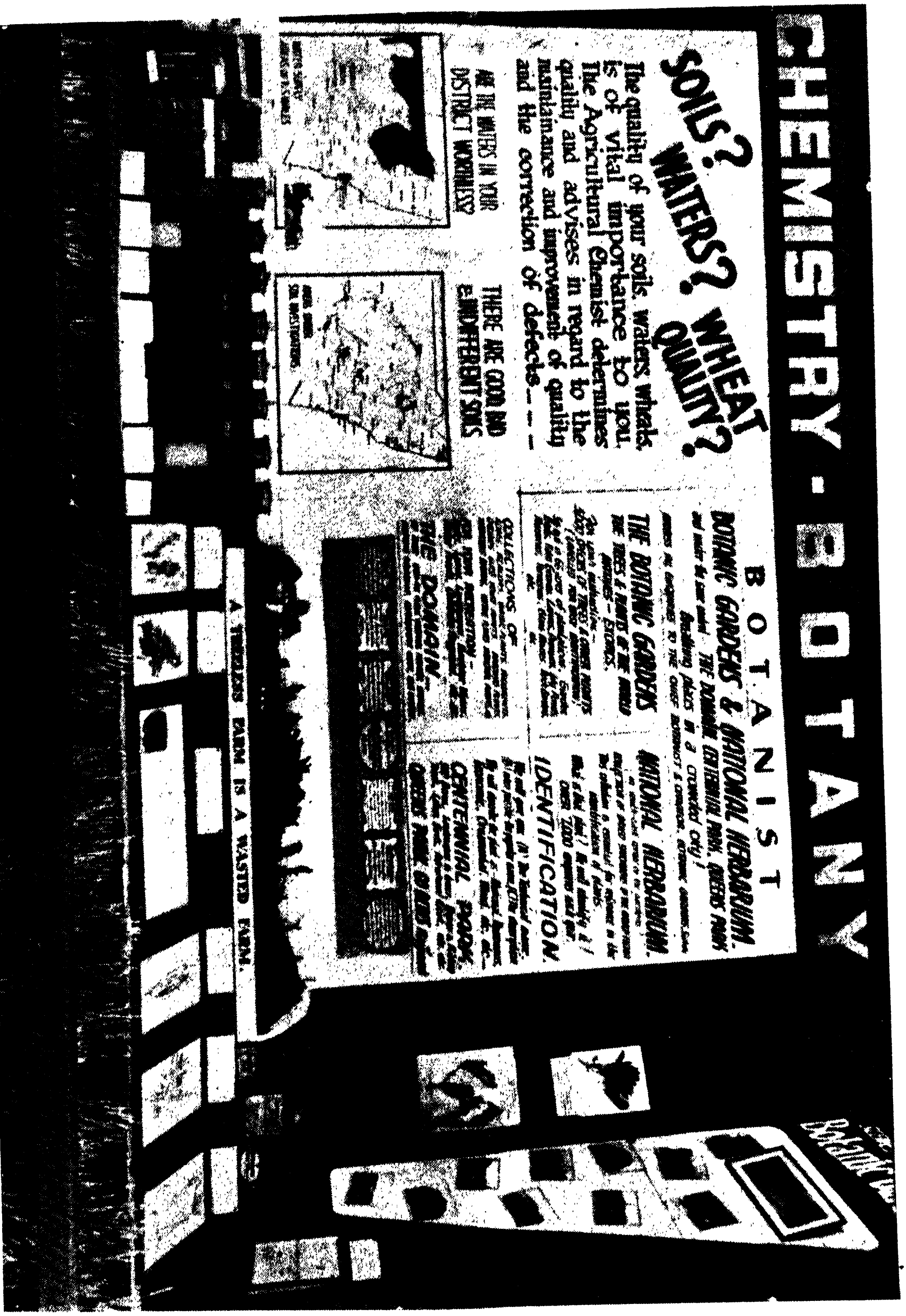
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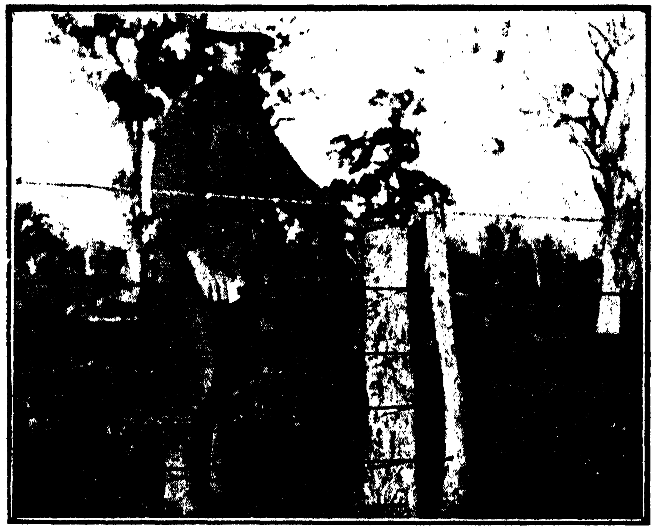
A FLOOD-PROOF FENCE.

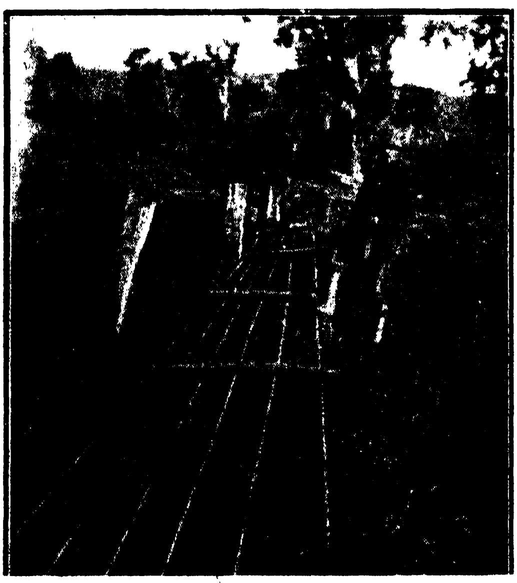
NOT least among the items of loss resulting from the floods which periodically lay waste many low-lying rural districts is that represented by damage to fencing, which is often so great that a large proportion of the material cannot even be re-used. Farmers in such districts are recommended, when occasion next arises to construct fencing on areas subject to inundation, to consider the advantages of adopting the collapsible flood-proof type described below.



The Normal Position of the Flood-proof Fence.
The fence proper is standing against the post, to which it is lightly attached.

THE details of the fence are as follow:—

The posts are 33 feet apart (centre to centre), and two wooden droppers are placed between the posts and another right alongside each post. The posts are bored with one hole 4 inches from the ground and 1½ inches from the edge on the lower side of the post (*i.e.*, the down-river side of the post), and another 3 inches from the top of the post and 3 inches from the edge. The posts are 6 feet long and are placed 2 feet 6 inches in the ground, and 3 feet 6 inches above ground.



How the Fence Falls Over during a Flood.

The droppers are bored 4 inches from the bottom and then at the following distances:—6 inches, 6 inches, 7 inches, 8 inches, and 11 inches, allowing the top barbed wire to rest on the side of the dropper, to which it is tied through the hole with tie wire. The droppers are 3 feet 10 inches long, and 3 inches by 2 inches or 4 inches by 1½ inches.

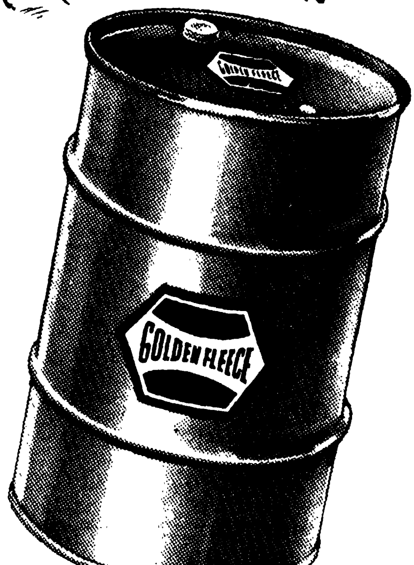
The bottom wire is reeved through the droppers and then through the posts. Each dropper near a post has a piece of galvanised wire passed through the top of the post, then round the dropper and tied so that it will give way in flood time, allowing the fence of droppers to collapse. The bottom wire (4 inches from the ground) holds the fence to the posts.

After the flood has subsided all that is necessary is to stand the fence of droppers upright again and attach it to the posts as before. All the droppers are tightly keyed to the top barbed wire, which is of No. 12 gauge. The black wire used is No. 8 gauge.

Strainers are placed every 12 chains and also at every bend or corner of the fence.

(*Continued on next page.*)

FARMERS! Here's a Money-Saving Tip!



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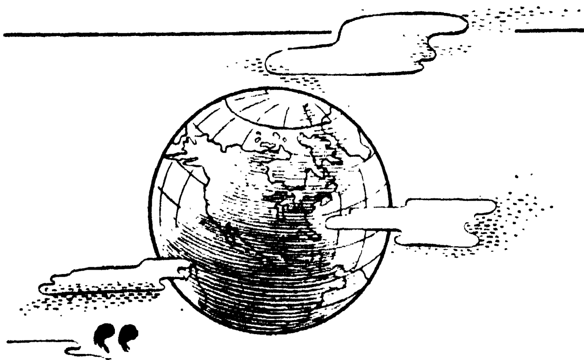

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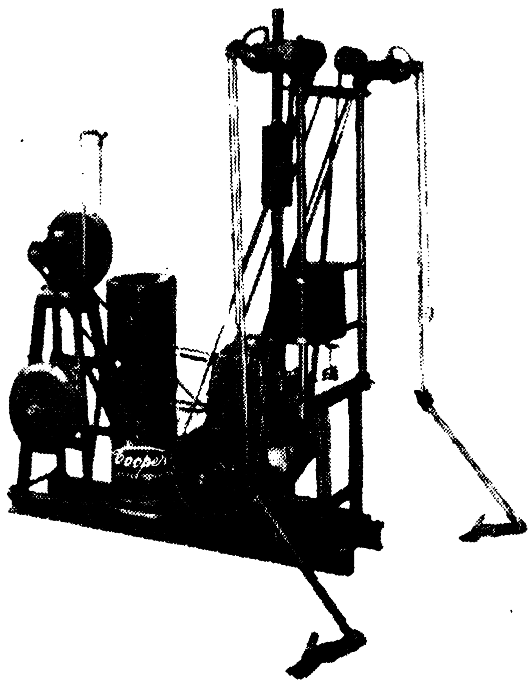

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Dorset Horn and Border Leicester Rams

Imported by Department.

FIRST shipment of New South Wales Stud Stock Delegation purchases of sheep to arrive included three Border Leicester and one Dorset Horn ram for the Department of Agriculture. These rams have been through quarantine and are now stationed at Wagga Experiment Farm (Dorset Horn), and the Border Leicesters at Wagga, Cowra and Trangie Experiment Farms.

The shipment also included one Dorset Horn and seven Border Leicester rams, and one Border Leicester ewe for private breeders.

Among other purchases yet to arrive are two Dorset Horn rams and two Dorset Horn ewes for the Department of Agriculture.

Two of the Department's imported rams are featured on the next page.

"Dunster's Idlecombe."

Dunster's Idlecombe (imp.) No. 21 (Stud No. DH326) was bought by the Stud Stock Buying Delegation for the Department from Mr. F. G. Luttrell, of Dunster Castle, Dunster, Somerset. This ram was bred by Mr. H. H. Morris, of Froglands, Carisbrooke, Isle of Wight.

Dunster's Idlecombe is a very stocky, solid-fleshed animal, with strong bone, and although the horns come rather close to the face he has a very masculine head and is very typical of the breed.

This ram is now at Wagga Experiment Farm and is being mated with a limited number of ewes which did not get in lamb in the spring. Although these lambs will be out of season it was considered desirable to give him a test mating.

"Willie's Expectation."

Willie's Expectation (imp.) was bred by Mr. W. Young, Skerrington Mains, Hurlford, Ayrshire—one of the keenest stud breeders in Scotland. Mr. Young sold this ram to Mr. Allan Howie, Morwick Hall, Acklington, Northumberland, who was using him with his top stud ewes when inspected by members of the delegation.

He impressed members of the delegation by his exceptionally good frame and very typical sire's head. His wool, also, was of the bold type required by New South Wales breeders. Amongst breeders in Great Britain he was considered as one of the coming sires of the breed.

After release from quarantine this ram was sent to Wagga Experiment Farm, and is now being used for service of selected ewes from private breeders.

This ram has already been seen by a number of Border Leicester breeders of this State and has been much admired. For this season he may not serve more than 40 to 50 ewes, but it is intended to use him to full requirements of breeders next season.

Flood-proof Fence—*continued from previous page.*

At the strainers or corners the droppers are securely wired to the posts. If the droppers are only loosely secured to all the other posts, when the pressure of flood waters comes against the fence it will fall downstream, and the water and debris will pass over it without tearing it away.

To make quite certain of the fence it would be of great advantage to ride along before the flood arrived and undo the wire holding the droppers to the posts. As those wires are only held around the droppers by one hand twitch of the wire they are quickly undone. If the directions given above are followed, however, there will be no need to undo the fence, as it will release itself very easily.

Stud Rams Imported by Department of Agriculture.

Dorset Horn Ram—"Dunster's Idlecombe" (Imp.).

Border Leicester Ram—"Willie's Expectation."

Classing Farmers' Wool Clips.

To Meet Present Day Requirements.

E. A. ELLIOTT, Sheep and Wool Expert.

THE wartime appraisement scheme under which the British Government acquired Australia's wool clip was terminated soon after the end of the war.

Few have questioned the benefits derived from the appraisement scheme during the difficult war years, and while many have welcomed the return of the auctions, the reversion to pre-war auctioning of the clip cannot be expected to run smoothly and be advantageous to the industry unless all woolgrowers appreciate fully what is involved.

Two important factors which wool men should keep in mind are:—

(1) A large quantity of lower grade wools (carry-over from the acquisition scheme) will continue to be fed on to the auction market during the next twelve years or so.

(2) Buyers under the auction system want their requirements in larger lots than provided for under the multitudinous classes of the appraisement scheme.

Improvement of Quality Necessary.

For seven years, mills working under war-time contracts used up a large proportion of the better-class wools. These comprised the well-grown, shafty Merino wools, come-backs and fine and medium crossbred wools. It must be realised that the carry-over of several million bales in Australia is made up largely of lower grade types—short-fibred, burry, seedy and other classes which were relatively expensive to manufacture.

Every effort, therefore, should be made by sheep-breeders to improve the quality of their wool and to reduce the proportion of inferior types.

Larger Lots Required.

Under the appraisement scheme, growers were encouraged to divide the clip into a greater number of classes than is demanded by the auction system. Growers should, therefore, revert to fewer classes which will make for larger lots, designed to suit the convenience of buyers. The buyer who has an order now for, say, 500 bales of a certain class of wool—because of the time factor alone—is likely to pass over the one-and two-bale lots to examine lots made up of five bales and over. In this way the small lots miss the competition of the bigger buyers and consequently may not realise their real value.

At the same time, just as much care is needed in classing clips for auction as under the appraisement scheme. Each class should be as even as possible in length.

quality and condition, and all unsound wools should be removed from the good fleece lines. It is the division of wool into *unnecessary* lines, because of slight differences in colour type, which should now be discouraged.

Skirting.

Fleeces should receive a certain amount of skirting, and should be classed into even lots. The idea of skirting is to remove any inferior wool—wool which differs very much from the good wool of the fleece. It may be shorter, lacking in character, lower in quality, heavier in condition, or discoloured.

This inferior wool is usually found round the edges of the fleece; it should be the aim to remove it all, and at the same time leave the fleece portion as bulky as possible. It is from this fleece portion that the best prices can be expected, so as much good wool as possible should be left on the fleece. Money is often lost when preparing the clip by skirting deeply, and so making an attractive line of "first pieces," but it is done at the expense of the fleece lines. All that good wool, if left on, would have meant so much more in weight in the fleece lots, for which is received perhaps from 3d. to 6d. per lb. more than for the "first-pieces." So the aim should be to skirt lightly, as long as the inferior wool is removed.

Remove All Urine-stained Wool.

Beginning at the breech, the first wool to attract attention is urine-stained wool which may be found on this part of ewe fleeces. This urine-stained wool should always be kept separate. Remove it from the fleece, from the "pieces," and if possible from the "locks," for if present in wool it will always lower the price of that lot. The reason is that the reddish stain given the wool by the action of urine can never be scoured out, and a lot containing urine stains, though it may otherwise be suitable for a light-coloured material, must necessarily be dyed to a darker colour than the stains present. In addition, urine has a rather damaging effect on the fibre, making it hard and occasionally brittle. For these reasons no buyer will seriously consider a parcel of good wool with urine-stained wool mixed with it. Removal of urine-stained wool, therefore, should be the first care in skirting. Keep it separate, and if wet, dry it, bale it, and brand "stained pieces." It may sell well if the wool is of fair length, but it certainly lowers appreciably the value of good wool.

Remove Burrs Where Possible.

The amount of burr (trefoil) present will have an effect on the depth of skirting. In large areas of the State trefoil is a valuable feed in a dry season, but of all the vegetable matter found in wool, and with which the manufacturer has to contend, trefoil burr is the worst. The numerous hooks with which the burr is covered affix it very tightly to the wool. Removal of the burr means added cost in manufacture. If the wool is very burry, and only of average length, carbonising has to be resorted to.

In lightly burred wool the burr is removed by an attachment to the carding machine. The spikes on the roller allow the wool to go between them, but the burr is left on the surface of the spikes; a set of blades similar to a lawn mower, revolving very close to the roller, removes everything that protrudes outside the spikes. But in this process a good deal of wool is lost—the wool to which the burr is clinging. Then, of course, burr present in wool (as is the case with all vegetable matter) affects the yield of the wool materially, and makes it more difficult to estimate.

The buyer, therefore, will pay more attention to a "free" wool—a wool free of burr—than to a lot of burry wool. For this reason, if it is possible to remove all the burr from the fleece portion without going too deeply into the good wool, it will certainly pay to do so. Nowadays, however, in many districts the burr is high up the sides of the fleece. In such a case it would be foolish to remove it all, as this would take most of the best wool. All that can be done in such cases is to skirt in the ordinary way, and by so doing remove the more heavily burred portions.

Skirt Each Fleece on its Merits.

On account of the unevenness in the wool grown on a sheep, it is often necessary to remove a good deal of the breech wool. The best wool on the fleece is grown on the shoulder, and it gradually decreases in value as it nears the breech, in some cases the breech being a good deal coarser. The variation in a crossbred will necessarily be greater than in a Merino, because of the different breeds used.

It should be the aim of every woolgrower to breed sheep bearing a fleece as even as possible all over, but a certain amount of variation must be expected as the fleece gets farther away from the vital organs of the body. So the breech wool is found coarser than the shoulder; in some only a slight variation is found, while in others there is a marked difference in quality and character of the wool.

Each fleece should be treated individually when skirting. Do not get into the habit of removing the same set amount every time; get out of the habit of thinking that because so much hangs over the edge of the table, that portion has to be skirted off. One fleece, showing very little variation, will need very little off the breech, while the next may run very coarse, and it will be necessary to skirt heavily on the breech. With crossbreds, on account of the greater variation, it will usually be found necessary to skirt fairly heavily on the breech, but here also each fleece should be treated on its merits.

Remove "Shankings" and "Yolk Locks."

The lower legs grow short, inferior wool, termed "shankings." This should always be removed. In the flank will be found a fringe of "yolk locks," the low-yielding wool, which, if left on, gives the buyer trouble in estimating yields. If the belly wool has been properly removed by the shearer there should be nothing to take off along the sides unless there is burr or grass-seed present. On the shoulder there is the edge of "yolk locks" and the "shankings," but it should be remembered that the shoulder wool is the best wool, and as much as possible should be left on the fleece.

Neck Wool Needs Special Attention.

As the shearer opens up on one side of the neck, the fleece, when spread on the wool table, will have one side of the neck wool—the left from the bottom of the wool table—much larger or heavier than the other. The light side should be all good wool, but the amount to be removed from the heavy, or left, side of the neck will depend on several conditions.

In Merino sheep there is usually a certain amount of fold development on the neck, and this means unevenness in the wool; the wool growing on top of a fold is lighter in condition and usually lacking in character compared with the wool between the folds. Then again, if any grass-seed is present in the body wool it is usually worst in the neck wool, as this is the first part of the body which comes in contact with the seed as the animals walk along.

So with Merino fleece it is generally found necessary to remove a good deal of the left side of the neck wool. With crossbreds there is not the same unevenness shown, and so very little is taken off in skirting. The wool off the top of the head and round the jaws is short, fuzzy, and low in quality, and has to be removed.

Regular Methods Save Time.

Care should be taken to see that the fleece is picked up properly, so that when thrown out it is in the right position on the table, otherwise a certain amount of time is wasted straightening each fleece.

A wool rolling table should not be against the wall. Skirting cannot be satisfactorily carried out if it is necessary to reach right across the table. If, on the other hand, the worker pulls the side towards him in order to skirt it, "yolk locks," etc., are often covered up. Have the wool table placed so as to have plenty of room all round it. Skirting will be done with the least expenditure of energy if two men work together, one on each side of the table. If one man is doing the work it is necessary for him to walk several times around the table while treating each fleece. This may mean a lot in the course of a day, whereas if two men work together the fleece is treated in a shorter time and with very little walking about. Then, while one is putting the fleece into its class the other can be picking the "pieces," etc. It will be found best to get into a regular method of skirting. Do not start on one fleece at the breech and on the next at the neck. All these unmethodical habits waste time and energy.

When skirting, give the fleece an occasional shake to dislodge any loose "yolk locks" or "second cuts" which may be attached to it. It is only natural that a certain amount of this sort of wool is picked up with the fleece. If left there, the value of the skirting is greatly minimised, as it is this low-yielding wool which it is most necessary to keep out of the fleece wool. By sweeping the floor after each sheep is shorn the least possible amount is picked up, and if the fleece is shaken while being skirted practically all the loose "pieces" will be removed.

Remove all Inferior Patches.

It has been stated earlier that inferior wool is found around the edges of the fleece, but there are times when portions of the fleece wool become much inferior to the good wool of the shoulder.

If Merinos are run on cultivation in a dry season, or if the country is very dry and dusty, the wool of the back becomes heavily charged with dust. When the back wool is seen to be much inferior to the other fleece wool it will be advisable to remove it. Very severe climatic conditions—hot sun, etc.—may cause the back wool to become wasty and tender. Here again it will be best to remove it.

In scrubby country, or where saffron thistles are bad, or after hand-feeding has been carried out, a patch of wool may be found at the back of the neck, at times, heavily charged with twigs, thistles, or chaff, as the case may be. When the amount of foreign matter has made that part of the fleece much inferior to the bulk the patch should be removed.

After a very wet season a patch of wool just above and behind the shoulders may become discoloured or wasty, due to the effect of the continued wet on the yolk and bacterial action. When noticed, this patch should be removed, as it spoils the appearance of the good fleece wool.

Rolling.

The reason for rolling is to get the fleece into a convenient bundle for further handling, and so that the wool is baled in as clean a state as possible. If not rolled, in getting the fleece from the wool table to the bin and then to the press, dust and dirt is likely to be picked up between the table and the press.

As it is usual in every trade and calling to "put the best side to London," the fleece should be rolled so that the shoulder wool is exposed. A regular method of rolling is desirable, in order that classing can be done properly. It has been mentioned that the shoulder wool is the best on the fleece; the breech is stronger (coarser), perhaps a good deal stronger, and usually poorer in character; while the back wool is lighter, dryer, more dusty, usually finer, and often slightly tender, on account of climatic conditions.

If the rolling is done in a slipshod manner the classer may waste a lot of time in his work or be led astray in his classes. For instance, a fleece comes before him with the shoulder exposed—a good type of wool—and he puts it into a certain class; the next one has the breech exposed showing a rougher and stronger type altogether. The classer does not bother to open the fleece, not expecting irregular rolling, and so puts the fleece in a lower class. Another fleece arrives with the back exposed, and on account of its wasty appearance must be put out of the top lines. Thus can be seen the need for a regular way of rolling the fleece.

The simplest way to expose the shoulder is to skirt from the breech towards the head, turn in the neck wool, fold over the edge only of one side, bring the other side right across to meet it, and then fold the same side over again. The back wool is now on top, and by rolling from the breech end, this back wool, which may show a slight wastiness or tenderness, is put inside and the shoulder wool shown.

Classing the Skirtings.

Before dealing with classing, the skirtings may be put into their different sorts. The following classification should be quite sufficient:—

"First Pieces."—The bright, attractive "pieces," with the low quality wool removed.

"Pieces."—The skirtings of the "first pieces," dull, discoloured wool, heavily conditioned "pieces" with the stains removed. Do not mark the low grade "pieces" as "second pieces." In fact, the word "second" on any class of wool seems to infer it is low grade; so it is as well not to use the term.

"Bellies."—The belly wool with the stains (in case of rams and wethers) removed. In the larger clips, say, 900 sheep and upwards, two lines of "bellies" can well be made by taking off the brisket wool and heavy, yolky wool from around the udder. The wool removed, and any very poor type bellies could be termed "bellies," and the good, bright belly wool, which has been much improved by this skirting, could be termed "A bellies" or "first bellies."

"Locks."—The sweepings of the floor and the wool from under the table—after the larger pieces have been taken out—make up the "locks." If practicable, it will also pay to keep the "stains" out of the "locks." In a large clip, at times, two lines of "locks" are made, the "board locks" being much heavier in condition than, and not so attractive in appearance as the "table locks."

"Stains."—The urine-stained wool should always be kept by itself for reasons mentioned earlier. Dry it if at all damp, bale, and brand "stained pieces."

The above lines are all that should be necessary in an ordinary clip. In a large clip special lines are sometimes made; for instance, in a bad grass-seed season all the neck wool has to be removed. It should be kept separate and branded "necks," or even made into "first necks" and "necks." Or if all the back wool is removed on account of dust or wastiness it may be advisable to make a line of "backs."

In treating crossbred skirtings, the very low, coarse breech wool should not be put in the "first pieces." The main consideration with crossbred wool is quality. The finer the wool the higher the value, so the rough, coarse wool, even in the skirtings, should be kept away from the "pieces" finer in quality.

Classing.

In a small clip of up to 200 fleeces not much can be done in the way of classing. Such a small lot, however, can be improved considerably by putting on one side those odd fleeces which look very different to the bulk. They may be, and usually would be, heavier in condition and duller in colour, or they may be finer, much shorter in staple, and wasty, or again they may be rough, harsh, and strong. These odd fleeces may not realise very much, but certainly by their removal the appearance of the bulk will be improved. Of course, even in this small clip, the fleeces should be carefully skirted.

Factors in Classing.

In a larger clip than the above, certain definite factors enter into classing. These are length, strength, quality, condition, and colour.

The buyer requires an even parcel of wool—even in length, because wools of different lengths are used for different materials, and cannot be manufactured on the one set of machinery without a lot of waste. Therefore, evenness in length is important in classing.

A buyer after a combing wool has no use for an unsound wool. As the name implies, a combing wool at one stage in manufacture is combed, and in that process a certain strain is imposed; the light, mushy tip is taken off, and any tender, unsound wool—wool without the necessary strength to stand the combing process—also goes off as "noil," or waste as far as a combing wool is concerned. For this reason, practically the first thing a buyer does when he comes to a lot is to test it here and there for soundness by holding a staple between the thumb and first finger of each

hand, and testing it with another finger. If odd staples are found which are tender, he knows that that portion would be so much loss to his firm, and consequently he leaves the lot alone—incidentally noting the brand—or else puts a much lower price on it to cover the loss of the tender wool. Testing for soundness, therefore, is very important in classing, and all tender fleeces should be kept away from sound wool.

Quality has to be considered, strong fleeces being kept separate from those fine in quality.

Condition must be considered also, because of the difference in "yield" between a light and heavy conditioned wool. The amount of vegetable matter present must be taken into consideration.

Colour, which is more or less dependent on the amount of condition, must be given attention when making an attractive line.

Three Fleece Lines Usually Necessary.

In a fairly even clip only three fleece lines, named and described as follows, should be necessary:—

AA.—Comprises the bulk of the fleece wool, sound, fairly even in length, quality, and condition.

A.—Comprises fleeces heavier in condition, and discoloured, usually shorter in staple, finer in quality, and sound.

Fleece.—Comprises the tender, unsound fleeces, and those with a break. If the clip is uneven, having a number of strong, perhaps harsh fleeces present, it will be advisable to make another class, which could be called "combing" to take in those fleeces stronger in quality or perhaps harsh in character.

These four classes should be sufficient even in a clip of fair size if it is from one line of sheep, but other classes are usually necessary because of the presence of hoggets, the wool from which is generally better grown, has more length, may have a wasty tip if not shorn as lambs, has more condition, and is consequently not so bright. Wethers, too, will cut a more bulky and bolder type of wool than ewes rearing lambs.

Classing of Small Clips.

In classing small clips, it is necessary to keep the number of classes as low as possible, so where a line of hoggets or wethers, as above, are present in the clip, the best method is to make, say, one special line of hoggets or wethers, as the case may be, to take the best of these fleeces and blend the remainder in with the other classes. This can usually be done, and may help to lift some of the ordinary fleece lines out of the "star lots," but it should not be done if it spoils the evenness of the different classes.

An endeavour should always be made to lift the better lines of the clip out of the "star lots," because it is recognised that "star lots" do not meet with so much competition, that the larger buyers do not bid for them, and so a lower price is obtained. Moreover, "star lots" are sold in a different sale room. It is only natural that buyers who are out to secure, say, 1,000 bales in a season would not look for their wool in lots of two and three when they can get it in lots of, perhaps, thirty and forty. So these big buyers would only come into the "star lot" room when their quota is almost completed. The buyers who operate in the "star lot" room are usually repackers, local manufacturers, etc.

Rams' Wool.

Rams' wool should always be kept separate. It is also best even to keep the skirtings separate, but this is not always done. Rams' wool has a sticky type of yolk, which is hard to scour out, a stronger scouring mixture being necessary, and the scoured article is usually rather harsh on account of the severe treatment given. There is often a strong odour in rams' wool by which it is easily recognised even before it is handled. If mixed with other wool this odour tends to go through it.

Black Wool.

Black wool should always be kept by itself, and the floor should be very carefully swept after a black sheep has been shorn to make sure that all the black fibres have been removed. Black wool will not scour white, hence the need to keep all black fibres away from white wool. If a sheep has a black spot, remove it and take a liberal edging of white so that any straggling black fibres may be removed. The best plan is to put the black and spotted sheep into the killing pen and not shear them at all.

Comeback Wool.

Comeback wool would be handled on practically the same lines as those men-

tioned for Merino clips; that is, if it is solely a comeback clip. If it consists of comeback and crossbreds, keep the comebacks from the crossbreds.

Crossbred Fleeces.

When classing crossbred fleeces the main consideration is quality. The finer the wool the higher the value, and consequently the coarse fleeces should be kept away from those fine in fibre. In a small clip only those two classes would be made. As the clip increases in size, perhaps three classes —fine, medium and coarse—could be made. A fourth class would be necessary in some mixed clips to take all very short, inferior fleeces of each of the above classes. These four lines should be sufficient for any ordinary clip of crossbreds, even up to several thousand.

The most usual method of naming the classes is: AAXB for the fine class, AXB for medium, XB for coarse, and BXB for an inferior class. If any British breed rams are shorn, their fleeces should be kept separate, as in the case of Merino rams.

Classing Lambs' Wool.

Before treating lambs' wool the table should be covered with a cloth of some sort, or the wool will fall through the rungs of the table. The usual method is to pick up the wool with two boards joined at one end with a short piece of leather. See that only one fleece is picked up at a time, as six single fleeces can be handled much more effectively than a heap containing six fleeces.

In a small clip all that is recommended is to remove the stained pieces or the blood-clotted pieces from the tail, which are the result of marking. These are of practically no value, and certainly should be removed.

In a lot of 300 lambs or more there will be a variation in age of perhaps two months, and though most of the lambs will have a fair fleece, the late lambs will only have short wool, so that two lines of lambs' wool should be made—"A Lambs," to take in the body wool of the well-grown lambs and "lambs" to be made up of the trimmings of the well-grown lambs, and all wool from late and short-wool lambs. In each case the stains or blood-clotted wool should be removed.

Baling.

When baling, the bales should be as even in weight as possible. Between 300 lb. and 336 lb. is a good weight for fleece wool; "pieces," "bellies," etc., usually being heavier. To get fairly even weights of fleece wool it is a good idea to count the fleeces into the bale, and when it is weighted you have a guide to go by. In a small clip a few mixed bales are unavoidable, but as few as possible should be made, and when two lots of wool are put in the one bale, be sure they are of about the same value, because the bale will always be valued on the lowest wool in the bale.

Deleterious Substances in Wool.

More or less regularly each year a general complaint is sent out from Bradford regarding the amount of foreign matter—principally jute fibres—which gets into the wool. This jute does not take the dye so thoroughly as wool, and as it cannot be removed beforehand, being so hard to distinguish, it has to be removed after the cloth is made. Over £500,00 a year is the estimated cost of removing these deleterious fibres from the material. There are three ways in which jute fibres can get mixed with the wool in the process of baling, and as far as possible these should be prevented. When the woolpack is put in the press there are often found to be long strands of jute threads inside; these can easily be cut off and removed. It is a good idea to give the woolpack a shake outside the shed before putting it in the press. Occasionally the corners of the pack are cut down slightly to make a neater bale. The short threads should be taken out of the corners of the bale, or they will get into the wool. When sewing, if the ends of the threads are thrown carelessly on the floor they will probably be picked up with some of the wool and put into the press. A small bag should be hung near the press, and all these waste pieces of thread, etc., should be put into it to prevent them getting into the wool.

POP CORN.

W. D. KERLE, H.D.A. Special Agronomist.

POP CORN has been an article of commerce for more than fifty years—particularly in the United States of America, where it is known to have been grown and used by the Indians even before the coming of the white man. In this State it is a comparatively small but important industry, expanding more each year as use of pop corn confections becomes more widespread. Apart from the growing of pop corn as a profitable commercial sideline, home growing and popping is interesting and could be more widely adopted.

Any type of soil that will produce satisfactory yields of ordinary dent maize is suitable for pop corn. Probably most satisfactory are the loams and sandy loam types well charged with organic matter. While coastal soils are quite satisfactory, the tableland districts are the most favoured for growing pop corn as they are free from weevil.

Soil Preparation.

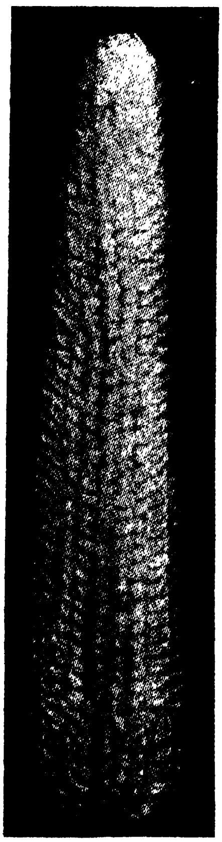
The soil preparations recommended for dent maize are suitable for pop corn. The chief essentials are early preparation and frequent cultivation to produce a good seed bed. The seed should only be planted deeply enough to ensure covering in a moist soil, and for this reason a well compacted seed bed is essential.

Sowing.

Sowing may be done in hills or drilled in rows. Three to four kernels planted in hills 36 inches to 42 inches apart each way, or one grain 10 inches to 12 inches apart in rows 3 feet 6 inches apart are satisfactory. The quantity of seed required per acre varies from 3 to 5 lb., depending on variety. The maize dropper is suitable for sowing, using a special plate. Pop corn should be sown at the optimum time for planting dent corn, and late planting must be avoided as immature corn will not pop satisfactorily.

Varieties.

There are three types of pop corn. They are the "rice" type, the crown of the grain having a sharp beak; the "pearl type" with the crown smooth and rounded; and the "hulless" type with long tapering grain. White and Red rice are typical varieties of the first type, and White Pearl and Black Beauty of the second. Japanese Hulless is the only "hulless" type tried here, but although it has superior popping qualities it does not yield well by comparison with "White Rice." White Rice is the only variety grown to any extent in this State. Seed must be pure and not crossed with field varieties as the excess of starch affects popping.



White Rice Pop Corn.

Cultivation.

When some inches high, the crop may be lightly harrowed to kill young weeds. The cultivator should be kept going between the rows to keep down weed growth, which may seriously influence the yield.

Harvesting.

Pop corn must be allowed to mature thoroughly on the stalk before harvesting. Immaturity in pop corn is indicated by the presence of chalky white starch in the crown of the grain or by an excess of starch around the germ. Such corn does not pop well and the excess moisture may also induce moulds.

Harvest the ears when the stalk is quite dead, and store in small well-ventilated cribs. A satisfactory crib can be constructed with 1 inch mesh wire netting. Threshing is done with the ordinary corn sheller. The ears must be sound and free of disease as only a small proportion

of discoloured grain will spoil the sample. It is not safe to shell and bag pop corn if the moisture content is in excess of 14 per cent. It cannot be used by manufacturers for popping until it has been dried down to the correct moisture percentage.

Yields vary according to climatic conditions, soil, etc., and may be considered to be 50 to 70 per cent. of field corn yields for the same locality.

Popping Quality.

The all-important factor in production of this type of corn is popping quality. The two factors which constitute popping quality are kernel expansion and crispness of the popped kernels. Varieties vary considerably in these qualities and also in the amount of "chaff" adhering to the tips of the kernels after shelling. Japanese Hulless is preferred by manufacturers because of its good kernel expansion and light "chaff."

Popping expansion, or volume increase, is due to the quick expansion of the internal moisture of the kernels and is materially affected by the following factors:

(i) Percentage of soft starch.
(ii) Percentage of moisture.
(iii) Disease.
(iv) Size of kernel.
(v) Proper application of heat.

The lower the percentage of soft starch the higher the expansion rate. The right percentage of moisture is very important. This varies chiefly with the time it is harvested and the variety. The best percentage for popping is 12 to 13 per cent. If the kernels have the right moisture content they should start popping in about 60 to 90 seconds after heat is applied. If the moisture percentage is too low popping takes place quickly and feebly with low volume increase. On the other hand if moisture is excessive it will steam and scorch with very little popping.

Home Popping.

An ordinary frying pan with a cover is used over a flame as hot as possible without burning. The kernels must be kept moving so that they will heat evenly and all pop somewhere about the same time. A low fire will result in a smaller percentage of pop or none at all. Correct heat and right moisture percentage are the chief factors in successful home popping. The kernels should start popping in about 90 seconds, depending to some extent on varieties, the larger grained ones taking longer to start.

Insect Pests and Diseases.

Pop corn is attacked by the same insects and diseases which injure field corn. The most serious diseases are root, stalk and cob rots which affect yield or quality of the grain. Insects causing most damage are the corn earworm, common in all districts, and the black beetle, bad in central coastal areas. The grain weevil and grain moth on coastal districts and grain moth in inland areas may cause much damage in mature pop corn before harvest or in storage. The damage caused by earworms and insects in mature grain is serious in pop corn because of its use as human food.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

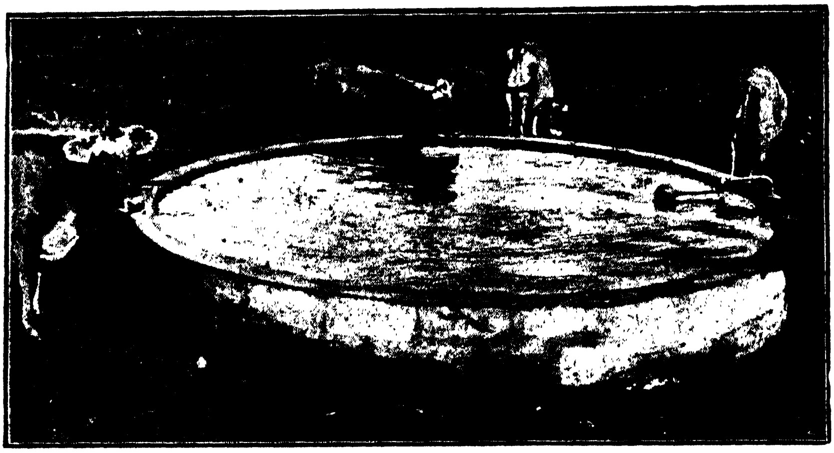
Bonalbo	April 30, May 1
Forbes (E. R. Woods)	May 2, 3
Dubbo	May 5, 6, 7
Gulargambone	May 10
Coonamble	May 13, 14
Trangie (R. R. Bailey)	May 20, 21
Gilgandra (Allan Christie)	May 20, 21
Walgett	May 22, 23
Condobolin (N. J. Hanlin)	August 5, 6
Albury Sheep Show and Fair (A. G. Young)	August 5, 6, 7
Trundle (W. A. Long)	August 12, 13
Peak Hill (C. McDowall)	August 19, 20
Parkes (S. L. Seaborn)	August 25, 26, 27
Young (Thos. A. Tester)	September 2, 3
Wagga (G. Dewey)	September 2, 3, 4
Forbes Show and Sports Day (E. R. Woods)	September 6
Corowa (W. T. Easdown)	September 12, 13
Walbundrie (C. Leischke)	October 1
Albury Annual Spring Show (A. G. Young)	October 7, 8, 9

CONCRETE RESERVOIR AND DRINKING TROUGH.

I. W. SCOTT, H.D.A., H.D.D., Special Dairy Officer.

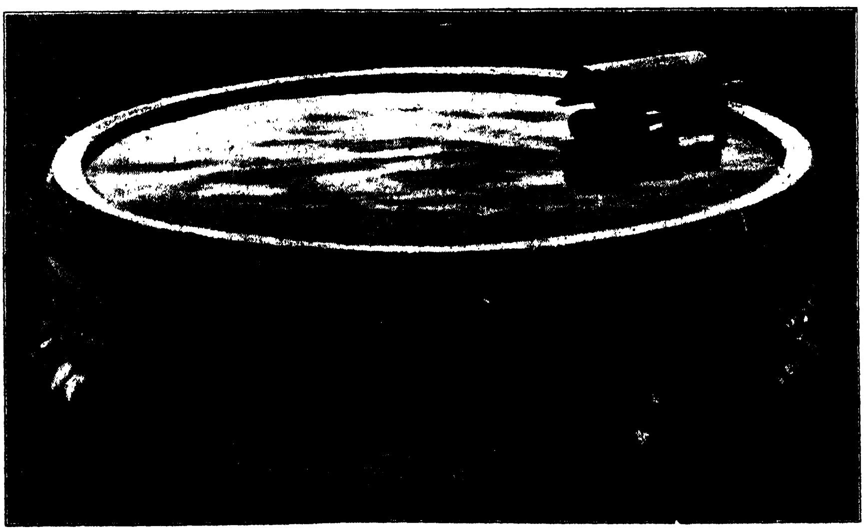
THE water reservoir and drinking troughs illustrated mark a very progressive move on the part of some farmers on the North Coast—indicative of a commendable desire to study the interests of their stock (and consequently of themselves) by supplying an ample supply of pure water that is easily accessible. The example could well be followed by many dairymen, who know to their cost the detrimental effect of poor water on milk production and cream quality.

The larger reservoir, which is built 18 inches out of the ground, is 14 feet in diameter; it has when full a depth of water 2 feet 4 inches, the capacity being about 2,200 gallons—sufficient to water a herd of eighty cows comfortably. At one farm on a hot summer day seventy cows that had been running in an old cultivation paddock all day reduced the level of the water 11 inches. The bottom consists of 6 inches of concrete smoothly finished off.



A Large Concrete Water Reservoir and Drinking Trough.

The ball cock should be in the centre of the reservoir.



A Smaller Type of Trough.

The walls are built of patented moulded concrete blocks, 6 inches thick, and situated at the bottom is an outlet for cleaning purposes. An overflow pipe is provided at the top, while the inflow of water is

regulated by a ball cock in a convenient spot. To prevent damage to the cock it should be situated in the middle of the reservoir.

On the farm at which the illustration was taken the trough is filled from a 5,000 gallon concrete reservoir, of identical type to the one illustrated, which in turn is filled per medium of a windmill. A galvanised iron storage tank, of say, 1,000 gallons capacity, could be utilised in place of the large reservoir to supply a constant flow to the trough.

A plentiful supply of pure water is essential if cows are to produce large quantities of milk and maintain health and condition. Running water and troughs are preferable to dams, etc., for this purpose, and concrete troughing appears to be the best and most economical method of handling the water supply. In the case of the larger reservoir illustrated, there is ample room for thirty cows (if need be) to drink at one time; consequently there is less danger of fighting and horning, and of cows getting tipped or pushed into the trough, and they can more easily get away from each other on account of its circular shape. The water keeps extremely cool; during the summer the top 2 inches may be hot, but stock soon learn to dip down or stir up the surface to get the cool water underneath. With 2,200 gallons of water and a drinking length of 44 feet, the herd can be watered with a minimum of disturbance and time. There is ample water to meet several days' requirements should the wind fail; that is, if wind is the motive power for pumping.

Such troughs seem to need less frequent cleaning than wooden troughs, are economical in the space they occupy, and, where the nature of the farm permits, could be used as a storage reservoir from which to reticulate water to other parts of the farm, as is done from the 5,000 gallon reservoir on the farm in question.

There is without a doubt distinct need for better water facilities for stock, and though initially the cost of a reservoir of this type may appear a big expense to many dairymen, the price is reasonable when consideration is given to the beneficial effects both on milk and cream quality, as well as on the stock.

Circular troughs of smaller capacity can be easily constructed, using a cross section of a galvanised iron tank as a mould. A trough of this type is also illustrated. Here again the ball cock should be fitted in the centre to prevent damage.

Approved Vegetable Seed—May, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Break-o-Day—H. P. Richards, "Sovereignton," Tenterfield.

Moscow—H. P. Richards, "Sovereignton," Tenterfield.

Tatura Dwarf Globe—H. P. Richards, "Sovereignton," Tenterfield.

To Prevent Frost Damage.

J. R. DAVISON, Fruit Inspector.

PROTECTION of fruit trees and vines against frost by heating is not new, but comparatively little information is available to help growers ascertain to what extent losses from frost damage might be controlled.

Tests to arrive at some definite information were carried out at Yenda as far back as the spring of 1936. They were made possible by the co-operative efforts of Mrs. C. Hudson, Farm 1546, Yenda, the Department of Agriculture, the Council for Scientific and Industrial Research, the Shell Co., and the Yenda Producers. The tests gave conclusive evidence of the possibilities of heating in the "frost pockets" at Yenda.

Unfortunately, an acute shortage of such necessary equipment as heaters and thermometers during the war drastically limited extension of orchard heating. With a return to more normal conditions, however, more extensive adoption of the practice should become possible.

Results of the initial tests, and conclusions drawn since then are given in the following article.

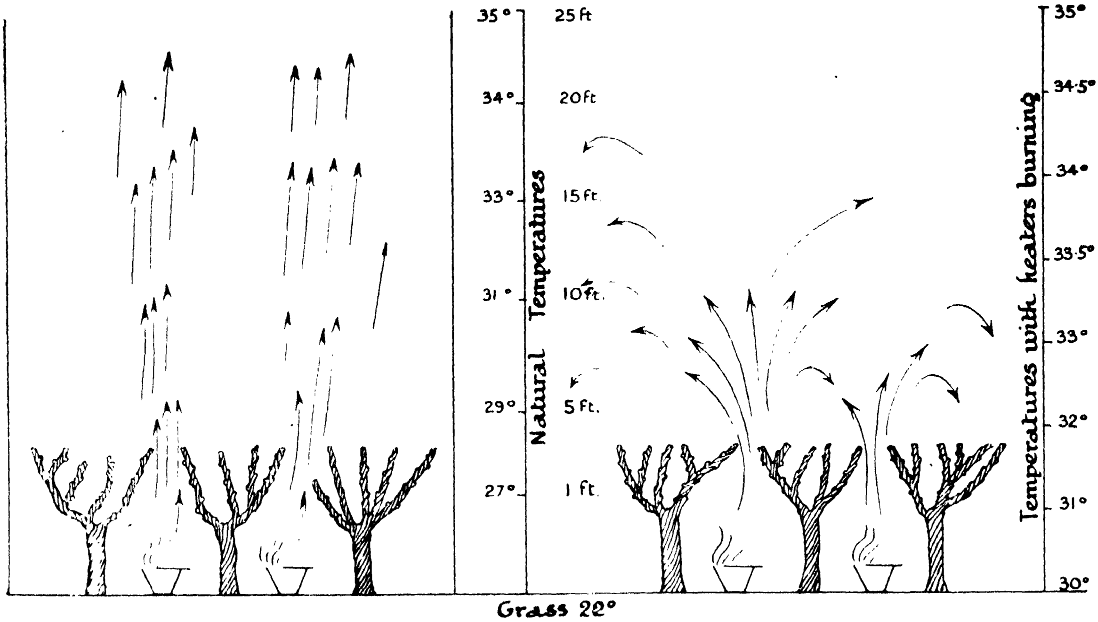
There are certain natural phenomena which govern the incidence of frosts, and which either allow for an economic heating, to obviate frost damage, or to show that the amount of heat required to effect a safe rise in temperature would be uneconomical. The term "frost pockets" is very apt, for it is applied to areas or pockets of country, especially liable to colder night conditions because of their nearness to certain topographic features. The worst pockets follow the northern to north-eastern fringe of the settlement, and even there they are worse on some soil types than on others—the general rule being the lighter the soil the heavier the frost liability.

Fundamentals of Orchard Heating.

(i) Heat radiated by the sun during the day is absorbed by the earth and the air above it, although the depth at which any appreciable rise is effected is not much greater than a foot.

(ii) The ground absorbs more heat than the air, and, when damp and undisturbed, absorbs and retains more than when either dry or freshly tilled. Freshly tilled soil, even though moist beneath the tilth, will absorb less heat than undisturbed dry soil. Free water lying on the surface tends to cool the air in contact with it by evaporation, but unless there is an appreciable movement of air over the surface such cooling effect is limited, and is probably more than offset by the higher humidity of the air near the ground. By sundown the position is that the temperature is higher near the ground, with a decrease at a more or less even rate with the increase in distance vertically.

(iii) When the sun's rays cease to heat the earth and air a reversal of heat exchange takes place. The ground radiates heat and in so doing heats the adjacent air which rises, colder air coming in, to be heated in turn, and to rise. This process goes on until a balance is reached, and a frost occurs when the radiation of heat brings the temperature of the surface soil and the air above it to below the freezing point of water. On a calm clear night, when conditions are optimum for radiation of heat from the ground, there is a layer of cold air over the surface with a rise in temperature as the distance from the earth increases. This rise is fairly even from three feet upwards, but from ground level to three feet there is often a greater difference than from three feet to twenty-five feet.



Diagrammatic Representation of Air Movement in Heated Orchard.

Left.—**Poor Inversion.**

The heated air rises too high to be of value for frost prevention.

Right.—**Good Inversion.**

When natural air temperatures increase rapidly with altitude the heated air does not rise greatly before meeting air of the same temperature, enabling the colder lower air to be heated economically.

"Inversion."

A few readings taken from records kept over a fair period in previous years will demonstrate this difference. The period was September, 1939.

Date.	Distance from the ground.		
	1 foot.	3 feet.	25 feet.
12th	28	29°	32°
14th	30°	31.5°	34°
19th	30.5°	32°	34°
20th	30°	32	35°
21st	29°	31°	33°
22nd	25°	28°	33°
23rd	25°	27°	33°

In orchard-heating practice this "inversion" is referred to as the difference between temperatures at the "ceiling" and the heating level.

"Ceiling."

The ceiling is the height at which air temperature is above the critical point for the crop being heated, and is therefore the upward limit or "ceiling" to which the heated air must rise before reaching naturally heated air of the same temperature.

It is the zone, or body of air, from three feet to the ceiling which needs to be heated to ensure no damage occurring. The height of the ceiling, and the difference in air temperature there and at three feet, determine whether or not a grower can undertake heating with profit. Where the ceiling is low and the inversion good it takes less heat than when the ceiling is high and the inversion greater.

In local practice it seems that, if the ceiling of 33 to 34 degrees Fahr. is at a higher level than twenty-five feet, and if the heaters at 60 to 70 to the acre are required to provide a rise of more than 7 degrees max. at 3 feet, it is doubtful if heating will be either successful or economical.

It is not necessary to maintain the temperatures with vine or stone fruits at any higher level than a half to one degree higher than the critical temperature for the crop. Often during a successful heating frost can be seen on the herbage at ground level.

In another trial with lemons which took place subsequent to the main work in 1937, it was found possible to safeguard the small summer-crop lemons throughout the winter without having to raise the temperature at three feet to more than 30 degrees Fahr. The outside temperature during these heatings was often at 24 degrees or lower. The ceiling was at about twenty feet, although it has been very much higher than that on other winter occasions. However it was necessary to heat so many times, and for such long durations, that the cost outstripped the returns for the fruit.

Critical Temperatures.

The Commonwealth Meteorological Bureau, Melbourne, supplied the following data, which shows the degree of cold which different fruits will tolerate for about half an hour without damage.

Fruit.	Buds, closed, but showing Colour.	Full Bloom.	Small Green Fruits.
Apples ...	27°F.	29°F.	30°F.
Apricots ...	30°F.	31°F.	32°F.
Almonds ...	28°F.	30°F.	31°F.
Blackberries ...	28°F.	28°F.	28°F.
Cherries ...	25°F.	28°F.	30°F.
Lemons ...	......	32°F.	30°F.
Oranges ...	30°F.	30°F.	......
Pears	28°F.	29°F.	30°F.
Peaches ...	25°F.	28°F	30°F.
Plums	30°F.	31°F.	31°F.
Prunes... ...	30°F.	31°F.	31°F.
Raspberries ...	28°F.	28°F.	28°F.
Strawberries ...	28°F.	28°F.	28°F.

Grape vines are susceptible to frost injury as soon as they commence to shoot. The critical temperature is 32 deg. Fahr.

Blossom, or shoots which are sheltered from the sky, will be at a higher temperature than exposed portions. Thus it is that on sultana vines the outer shoots will be killed before those nearer the central arms.

Because of temperature inversion the top of a tree will be warmer than the bottom laterals. Growers will know by experience that the top of, say, an apricot tree may crop normally while the lower portions will bear no fruit at all.

Heating, with a good inversion, is very satisfactory indeed, but with poor inversion any heat generated by a burner will contine upward to a height which would make the heating valueless.

When the heated air reaches air its own temperature it spreads laterally. So it is that the larger the area heated, whether it be on one farm or on a group of farms in close proximity, the less heat per acre is needed.

In 1937 a rise of 4 deg. Fahr. was obtained from similar heaters during a period of 2½ hours' burning, under the following conditions:—

70 heaters on 2 acres (apricots) used 45 gallons.
360 heaters on 12 acres (vines) used 130 gallons.

It was also noticeable during a light frost of 14th September that smoke drifting south effectively protected vines where the heaters were not lit. Subsequent comparative costs also point to this as being true.

Prevention of Damage.

Three main factors must be considered by the grower who suffers periodic loss of crop through frost damage:—

(1) What increased return would accrue from a heated orchard as against the returns after damage had been done by frost. It must be remembered that frosts not only ruin the current crop, but often have a stultifying effect on the wood and buds for the following season. The writer has seen vines so hit that no live canes were left on the main arms except for a few water-shoots starting from underneath, and these shoots naturally were not fruit-bearing in that year.

(2) Whether the degree of inversion is great enough to allow of economic heating.

(3) Whether the cultural practices followed are likely to aggravate the position, or tend to lessen the degree and shorten the period of a frost.

Whilst this article is primarily concerned with the practice of heating, the fact remains that it is definitely possible to vary the first two factors appreciably by following certain cultural methods. In fact, it is possible to obviate light frosts, and to reduce the severity of heavy ones. These practices have a bearing on the exchange of heat, and to state them briefly will be of interest and value.

Tillage Increases Frost Susceptability.

The condition of the surface inches of the soil has a great effect on this exchange of heat. The degree of frost damage is increased where the orchard is in a state of dry tilth—whether irrigation has been applied or not prior to the tillage taking place. Dry tilth does not absorb as much heat as moist, undisturbed soil. This fact has been demonstrated time and again. Where tillage of an orchard has not been completed on the evening of a frost, next day has shown negligible or no damage on the undisturbed soil and much damage on the cultivated area.

The best condition an orchard or vineyard can be in during the frost-liable period is moist throughout the root-zone, with the surface clear of any weed-growth, and undisturbed. This condition is best obtained by turning the cover-crop in early enough, and irrigating in August or early September, according to the type of crop growing. For several reasons it is generally advisable to apply the first irrigation about three to four weeks before bud-burst. No tillage should then take place until the danger of frosts is past.

Effect of Cover Crops.

Cover-crops raise the level of the "grass" temperature, producing readings as much as two degrees lower than on adjacent, comparatively clear country. This factor is not so important with trees, as the bearing area of the tree is practically all above three feet, whereas the average vine has the best part of its crop at about this level. Standing cover-crops in alternate bays can often act as a trap for cold air in the clear bay, and so give at least as bad an effect as if the whole were under cover-crop. If for some reason cover-crop has to be reduced during the critical period, it is better to mow it down—or failing a mower, disc in such a way that the crop is knocked down without cutting into the soil. If this cannot be done it is better to leave well alone, for once the surface is broken one of the worst conditions for frost will follow. As far as vines are concerned, it is advisable to have the cover turned in early, and irrigated early.

Pre-Blossom Irrigation.

Dependent on the variety, it may be, and usually is, necessary to irrigate just before blossoming. Some vineyards on deep soil may get away with only the one, but as the general run of farms in the Yenda district do not contain such patches of soil, irrigation just before blossoming, or even a little earlier, is generally necessary. Although it will delay bud-burst a little, if the ground is left dry it will still not delay it until the frost period is over, and in the event of a late frost the weaker shoot will be hit harder than the sturdier shoot on the vine irrigated early.

Trees are slightly different in that, as stated before, they crop at a much higher level than vines. If the cover is one that is sown annually it is best to follow the practice as with vines. If, however, it is one of the self-sown sorts such as Burr clover or Sub. clover there is no need to turn it in before it has seeded down and the

frost period is over, provided that the surface soil is not allowed to become unduly dried out during the critical period. There is naturally a greater usage of water where there is a cover growing, and that tends to dry the surface out.

Heat from Turned-in Cover Crops.

Another point worth considering as far as vines in particular are concerned: Where the cover has been reduced in July or early August, and irrigated, it soon rots, and in so doing there is a certain amount of heat generated during the period of rotting. This heat can have an appreciable effect on raising the temperature of the air adjacent to the soil surface on a cold night.

Consideration of the above points will show that it is quite possible to influence factors which govern occurrence of frosts. Temperatures during the critical period can be kept higher, and where it is necessary to light up, less oil needs to be burned in order to achieve the required results.

(To be continued.)

To Clarify Muddy Water for Domestic and Farm Use.

CLAYEY matter which is too fine to settle, and which causes water to appear muddy, can be removed by adding to the water small amounts of harmless chemicals, advises the Chemist's Branch of the Department of Agriculture.

Among the chemicals which can be conveniently used to clarify water alumino-ferric (crude sulplate of alumina) is probably the most effective. This substance is readily obtainable, and a comparatively small amount of it will quickly cause the fine particles of clay and other suspended impurities in the water to settle. One pound of alumino-ferric is sufficient for the clarification of 3,000 gallons of water.

The process of clearing is best carried out in the following way:—

The water to be cleared is put in a large tank or wooden hogshead, and the alumino-ferric, which has been previously dissolved in water, is added slowly to it. The contents of the tank should be stirred with a long stick or pole in order to mix thoroughly the water with the solution of alumino-ferric. The water in the tank is then allowed to stand undisturbed for some hours,• when it will be found that the fine suspended matter has settled to the bottom and left the water above perfectly clear and suitable for domestic use.

Water in dams can be similarly clarified, but in this case the least disturbance of the clay on the sides or bottom of the dam will make the water muddy, and it will probably not clear again without another treatment.

Where a turbid water has a slightly acid reaction, the use of alumino-ferric by itself is not sufficient to clear the water satisfactorily; in such a case a small amount of ordinary washing soda (carbonate of soda) must first be added to the water in order to make the latter faintly alkaline. When this change has been brought about, the alumino-ferric at the rate of 1 lb. per 3,000 gallons is added as before.

It is only rarely that carbonate of soda in addition to alumino-ferric is required. In order to find out whether it is necessary or not, a couple of gallons of the muddy water it is intended to clarify should be put in a bucket and a small amount of alumino-ferric added to it. If the water clears readily after standing twelve hours or so then the use of carbonate of soda is not necessary. If, on the other hand, clearing does not take place in this time, washing soda at the rate of 1½ lb. per 1,000 gallons of water must first be added.

Crude sulphate of alumina in the relatively small quantities required for clearing water is harmless to man and livestock.

Sowing Rates for Lucerne.

WHEN sowing lucerne, it is not wise to run the risk of a thin crop through a little parsimony in seeding or by using poor quality seed. It is all-important, with a permanent crop such as lucerne, that a good stand should be obtained at the outset.

Re-seeding cannot be done without again breaking up the land, and this means that a year or more is lost. If re-seeding is not done, the yields are permanently affected through the poor stand. Attempts are sometimes made to remedy unsatisfactory stands by sowing further seed, but they are seldom successful. The soil is not in a receptive condition, and what plants do grow have to contend with established vigorous plants.

At the same time it is a mistake to endeavour to remedy defects in preparation, or in the state of the soil, by heavier seeding. Favourable conditions are required to promote germination and to help the young plant, and seeding should only be done after they have been obtained. If the ground should happen to be dry at seeding time, heavier seeding will not secure a proper stand.

In the regular lucerne-hay producing districts of the State, from 10 lb. to 12 lb., and even 15 lb., of seed per acre is applied: for dry districts, such as the Riverina, 6 to 8 lb. will be found quite sufficient if evenly applied. For grazing purposes in dry districts 2 to 3 lb. per acre is ample.

THE FARM HOME.

APPLE PULP.

Preservation for Home Use.

JUNE CHANCELLOR, Dip. Home Ec., Fruit Preserving Instructress.

BECAUSE of the tremendous scope for apples in cookery it is advisable wherever possible to preserve them for future use. Apple pulp is easily prepared and preserved by home methods, and in this form it may be converted quickly into a variety of dishes as required. It is not necessary to add sugar when preparing apple pulp as it may be sweetened to taste before it is used.

Preparation.

1. Use stainless utensils to prevent discolouration of the fruit.

2. Wash the apples, peel and core. Slice or cut into quarters as required.

3. Place the fruit in a preserving pan with a little water. The quantity of water should be just sufficient to prevent the fruit scorching.

4. Simmer till tender if the apples are to be used for real pulp, or till semi-transparent if a sliced pulp is required. The time of cooking will depend on the variety of the apples and the amount of fruit being handled. As a general rule 20 to 30 minutes is necessary for pulp.

Filling the Jars.

The boiling pulp should be ladled into hot jars at once. Handle one jar at a time, taking it out of the boiling water, filling and sealing immediately. It is important to remember that perfect jars, rubbers and lids should be used to form a complete seal and so ensure safe keeping. When filling the jars leave about ¼ inch space at the top.

Processing.

It is advisable to process the jars of apple pulp in a boiling water bath. This should be done straight after sealing while the jars are still hot. Place the jars on a stand in a deep boiler or copper containing sufficient hot water to cover completely. If a stand is not available a padding of hessian or towelling should be placed in the bottom of the boiler. Process 10 minutes from the time the water comes to the boil. Remove the jars, allow to cool and store for future use.

Some Uses of Apple Pulp.

1. Place the required amount of sweetened pulp in a pie dish. Cover with pastry, sponge or batter mixture and bake as required.

2. Sweeten and combine with a suitable pastry to make apple tart, slice or roll.

3. May be combined with suet pastry to make boiled or steamed apple pudding.

4. For stewed apple, make a syrup out of the required amount of sugar and water. Mix into the apple pulp and cool.

Apple Recipes.

Spiced Apple Crumble.—

3 cups apple pulp.
1 cup self-raising flour.
3 oz. butter or margarine.
2 tablespoons brown sugar.
1 teaspoon mixed spice or cinnamon.

Sweeten the apple pulp and place in a pie dish. Sift flour and spice, add brown sugar, then rub the butter evenly through the dry ingredients. Sprinkle this over the apple pulp and bake in a moderately hot oven till golden brown. May be served either hot or cold with cream or custard sauce.

Apple Whip.—

1½ cups sweetened apple pulp.
1 pkt. jelly crystals—lemon flavour is best.
½ pt. hot water.
½ cup cold custard sauce or whipped cream.

(*Continued on page 267.*)

PROBLEMS FACING YOUNG BEEKEEPERS.

SHORTAGE OF HIVE MATERIAL.

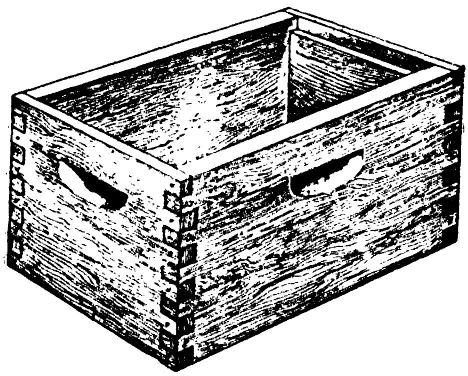
YOUNG beekeepers were faced with a large number of problems during the season just ended. A shortage of hive material from factories was one of the main factors limiting the extension work in the apiary which they were so anxious to carry out. Shortage of material was no fault of the manufacturers of bee-hives; they made every effort to secure suitable timber, both from local and overseas sources. However, as a result of the exceptional demand at this time for timber for housing and other urgent needs, and the fact that control over distribution had been relaxed, it was impossible to secure anything like the required supply.

With severe rationing of hive-bodies, covers and bottom boards, many young beekeepers, including a number of ex-servicemen, were forced to spend a good deal of time looking around for useful or make-shift supplies of timber, and to construct hives at home. Some of them were able to secure supplies from timber merchants, or purchased Pine Trees (*Pinus radiata*) and got them cut into boards at saw mills. Others secured some useful case timber, or resorted to using all sorts of make-shift boards. Unfortunately, the majority could not obtain sufficient of any sort of timber at the time when colonies of bees could have been increased in the apiary. There was a loss of honey production too, because of insufficient supply of supers available for honey storage.

Lesson From Past Season.

The industry is likely to be faced with further problems next season; and taking a lesson from the past, beekeepers will need to make the best of the winter months for securing timber from every possible source, and have it prepared ready for immediate use when required from spring onward. Any prepared hive-bodies, etc., along with any manufactured material which can be obtained, will prove most helpful during the active working season, as there may be little time available then to attend to hive-making. It is most important to secure factory-made frames, as the beekeeper generally cannot make frames satisfactorily even if it were possible to secure the special timber required for the purpose. In view of this, we can only hope that sufficient supplies of frames

will be available from factories, and the Department has been assured that every effort will be made to this end. However, the manufacturers are not happy about the position in regard to the availability of sufficient quantities of special timber for making the large number of frames required, A good deal will depend on whether a larger quota of timber from New Zealand, or from limited local sources, can be diverted to the manufacturers. To assist in this matter, the Department is making urgent representations to the authorities concerned in the distribution of timber.



A Factory-made Hive Body.

Points in Constructing Home-made Hives.

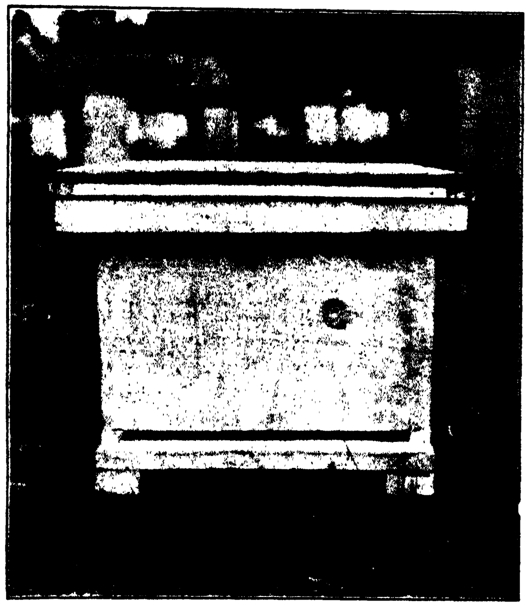
In making up home-made hive bodies, it is recommended that a factory-made one be used as a guide in the matter of measurements. Where boards of the right thickness are not obtainable, thinner boards doubled to make up the 7/8 inch thickness or thereabouts may be used. Hive-bodies to hold eight frames, when nailed, should have inside dimensions of 18¼ inches by 12⅛ inches by 9½ inches in depth. The rabbet to hold the lugs of the frames is ⅝ inch deep by 7/16 inch wide. This rabbet may be allowed for when it is necessary to use thinner end-boards, by joining together two boards and leaving the inside one ⅝ inch shorter than the outside one. The rabbet is shown clearly in the illustration of the factory-made hive.

In the home-made hive, as illustrated, a number of short boards were used to make up the bottom board, these being nailed to two stout supports running lengthwise. This may be reversed, of course, where long boards are available for the floor, by nailing two or three supports cross-wise. A good deal depends on the type of timber available and whether wastage may be minimised in the make-up. The same applies to the hive cover: a flat board cover may be made from a number of boards the full length of the hive body nailed to two stout supports, in place of a telescopic cover, as shown in the illustration. In this instance the supports will be on top of the cover and flat galvanised iron or other type of material may be used to make the cover water-proof. New galvanised iron is very scarce, but serviceable material may be cut from old corrugated sheets which have been removed from buildings or out-houses, when the corrugations have been well flattened out.

Fixing Foundations Firmly in Frames.

Many young beekeepers have not made a good job of fastening full sheets of comb-foundation into hive-frames. The difficulty may be overcome in future by adopting the following plan:—

With a full depth frame in which four wires have been placed and pulled taut, turn it bottom bar upward. Insert the sheet of



A Well-constructed Home-made Hive.

foundation between the first and second wire from the bottom bar, then pull it down carefully toward you over the second wire, then alternately under and over the two lower wires. This leaves two wires exposed on each side of the foundation. If the frame

top-bar is a single-groove type, the end of the foundation is inserted to the full depth of the groove. For single-wedge frames now most commonly used, the wedge is removed before inserting the foundation, and before being replaced the wedge must be reversed to grip the edge of the foundation, then pressed in firmly and nailed with four thin ½ inch nails.

The next procedure is to embed the wires into the foundation. Embed the first wire from the top bar, then turn the frame over and embed the next one, and so on until all four are completed. With the foundation fixed in as described, and the wires properly embedded, it will hold even in single groove-frames without further aid to secure the edge of the foundation to the frames. In addition, the foundation will hold in position much better than when the usual plan is used of placing the sheets flat down on all four wires. The plan, of course, is for the young beekeeper who has not yet arrived at the more advanced stage of using an electric embedder, and must depend, for the time being at least, on a spur-wheel type. The wiring and fixing in of comb-foundation in frames should be left until the time is approaching for the frames to be given the bees to build combs. All other preparation of hive material should be proceeded with in the meantime.

Why Bees Sometimes Refuse to Work on Foundation.

Other observations during the season have revealed the fact that many young beekeepers were rather puzzled over the reason why their colonies of bees during certain periods would not make any attempt to build combs from foundation, even though additional accommodation for the bees appeared to be urgently necessary. The reason was, of course, that the honey flow had ended, and only sufficient supplies of nectar and pollen were available from the fields to provide for the daily needs of the colonies in brood-rearing. Under these conditions, the foundation could only have been built into complete combs by the bees drawing on their reserves of food stored in the hive. Bees need to consume at least six pounds of honey to produce one pound of beeswax, and under the circumstances they refused to draw on their reserves of food for the purpose. Maybe during spring they will take a little risk in this direction, in order to give the colony a chance to become properly established following winter, but not at other times. Occasions do arise when it is worth while to feed small colonies when little is coming in from the fields, in order to encourage them to continue with comb-building work.

Internal Economy of the Hive an Interesting Subject.

A study of the internal economy of the hive is of very great interest to young beekeepers. The first sign that all is not going well in the fields is when the workers hang on to the wings of drones coming out of the hives, and attack any that may be attempting to return home. This activity will intensify as time goes on until scarcely any drones are left alive. Even drone brood will be pulled out of the cells, and hundreds in the pupae stage may be observed on the ground near the hive entrance. This happened between honey flows during the past season, and a number of young beekeepers became rather alarmed, thinking that some disease may have been present.

The next phase of economy is when the colonies commence to reduce brood-rearing in order to conserve their food supplies. However, up to a reasonable limit, there is no need for anxiety, provided the colonies have a useful supply of stored food. Nevertheless, where the position continues to depreciate, it is desirable that the hives be moved to a new location where at least some useful sustenance can be secured; or as an alternative the colonies should be given stimulative feeding.

Preparation for Wintering the Colonies.

Beekeepers who have not planned to move on to coastal heath country, or to warmer inland areas where winter honey flow prospects are satisfactory, will need to ensure that the colonies are comfortable and compact in the hives, and that an ample supply of stores is available. Average-sized colonies winter best in double storey hives, and it is advisable to remove any additional supers. In the matter of winter food, it is generally possible to equalise the frames of honey—particularly in areas where late honey flows have occurred. If this equalisation plan falls short of food requirements, any remaining needy colonies will need to be fed.

PLANT DISEASES

SPOTTED WILT DISEASE OF POTATOES.

R. D. WILSON, M.Sc., M.Sc.Agr., Plant Pathologist.

THE potato is one of the many species of plants which can be infected by the virus responsible for the well-known spotted wilt or bronze wilt disease of tomatoes.

Spotted wilt of potatoes has been known in this country for many years, but it has come into greater prominence during the past season as a serious disease of potatoes because of its widespread occurrence in some sections of the Tableland potato-growing areas in New South Wales. The outbreak has been of most serious concern because it has resulted in rejection for certification of many crops which, in other respects, such as freedom from leaf roll and mosaic, were of an extremely high standard.

Symptoms of the Disease.

Black or brown dead spots, varying in size and shape, but frequently almost circular, appear first on the younger leaves of the plant. Sometimes there is a browning or blackening along the veins. The disease may extend to the growing points, causing blackening, wilting and death of the shoots. The blackening may extend down the stalk and, in extreme cases, the whole of the shoot will be killed. Very often only one of the several stems in a hill shows symptoms, although sometimes all are affected.

The circular spots on the leaves often show somewhat concentric markings if examined carefully, and these are not unlike the leaf spots produced by the target spot or early blight disease which is caused by the fungus *Alternaria solani.* Target spot, however, differs from spotted wilt in that the first leaves to show symptoms of target spot are the older leaves near the ground—that is, target spot progresses upwards from the base of the plant whereas spotted wilt appears first at the top of the plant.

Most of the tubers on plants affected with spotted wilt will show symptoms but some of the smaller later-formed tubers may show evidence of infection in the form of blackened tissues, sometimes accompanied by a cracking of the skin, around the eyes.

Disease is carried by Thrips.

Spotted wilt is carried from infected to healthy plants by thrips and it is known, in the case of the same disease on tomatoes, that dry seasons which favour thrips are those in which spotted wilt is of most consequence. The same appears to apply in the case of potatoes.

The spotted wilt virus can infect a large number of plant species. The host range

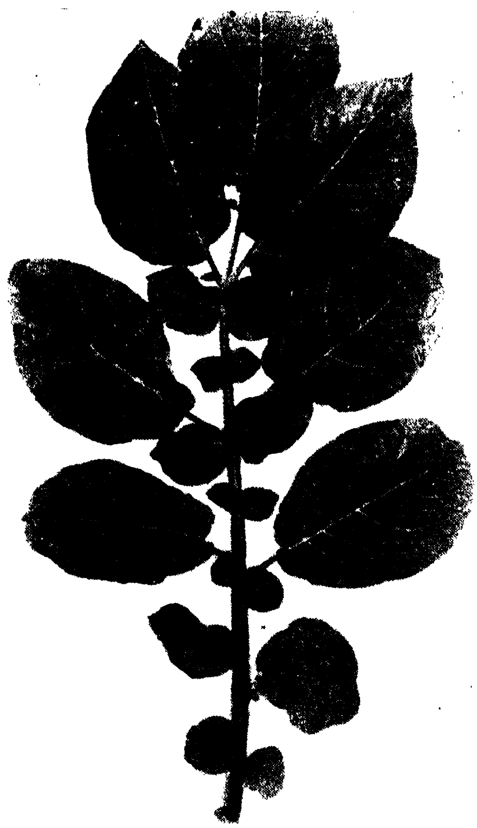


Fig. 1.—Spots of Dead Tissue on Potato Leaves, caused by Spotted Wilt Virus.

includes vegetable and field crop plants such as tomatoes, potato, tobacco, pepper and lettuce, garden flowers such as dahlia, nas-

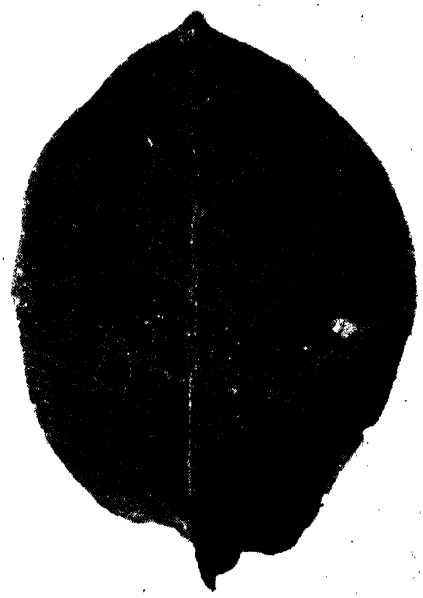


Fig. 2.—Dead Tissue, showing Characteristic Concentric Rings formed by Spotted Wilt Virus on Potato Leaves.

turtium, iceland poppy and zinnia, and many weeds.

It is known that spotted wilt can be carried over in the tubers but it has been shown* that only some of the tubers produced by spotted wilt-affected plants carry the virus. Tubers which do carry the virus produce plants which usually die off within a few weeks of emergence from the ground. Some plants grown from infected tubers may survive two months or even longer, but the plants are always stunted. Sometimes new shoots come out from the base of a shoot which has died off. These may be healthy at first but later they die like the main stem.

Economic Importance of Spotted Wilt in Potatoes.

The direct and indirect effect of spotted wilt in potatoes may be considered from three aspects, namely:—

1. The direct effect of spotted wilt on the yield of tubers.

2. The carry-over of the virus in potato tubers from one season to another, and its distribution by this means from one place to another.

3. The effect of spotted wilt on our potato seed certification scheme.

Observations to date in this country indicate that spotted wilt in potato crops grown for table purposes is not so serious economically as it is in the case of tomatoes and lettuce. Even where the percentage of spotted wilt-affected potato plants is of the order of 30 to 50 per cent.—and some such cases were observed in the past season in the Orange-Millthorpe (Central Tablelands) district—it is doubtful whether the reduction in yield of tubers would exceed 10 to 15 per cent. Yield reductions to this extent are quite serious enough but they are not comparable with the losses of 50 to 100 per cent. sometimes encountered in tomato and lettuce crops. If seed tubers from a very severely diseased crop were used, it is possible that, under some circumstances, yield reduction could be much higher than those mentioned above.

Fig. 3.—Leaf Spots caused by the Fungus *Alternaria solani* resemble the Lesions of Spotted Wilt. However, they are usually larger, more angular and appear first on the Lower Leaves. Concentric Rings may be present.

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As far as is known, spotted wilt is not carried in the true seed of any plants—that is, tomato seed or lettuce seed harvested from affected plants does not carry the spotted wilt virus. Infection of such crops

Norris, D. and Bald, J. G. Transmission of spotted wilt through potato tubers. Jour. Aust. Inst. Agr. Sci. 9 : 34-35. 1943.

normally comes from other affected plants growing nearby. As spotted wilt is carried over in potato tubers, diseased tubers can serve as a source not only for the potato crop, but for other susceptible crops, such as tomatoes, grown nearby.

Potato crops submitted for certification which show more than a small percentage of spotted wilt, leaf roll, mosaic, witches broom, Fusarium wilt and off-type plants, are rejected for certification and the tubers cannot be sold as certified seed tubers with a blue label attached to the bag. The outbreak of spotted wilt in Tableland crops this season has resulted in many otherwise excellent crops of potatoes being rejected for certification. There have been so many rejections this season that there will be less certified seed available than usual.

Purchasers of seed potatoes who cannot obtain any certified seed will, in many cases, have no means of distinguishing between seed tubers from crops severely affected with spotted wilt and leaf roll and tubers from crops affected with spotted wilt and almost free from leaf roll. Further experience with spotted wilt may permit a higher tolerance in certification for this disease than imposed at present.

It is not known whether the outbreak of spotted wilt in Tableland potato crops this season means that the virus has become permanently established in weeds in these potato growing areas, or merely that the unusually dry season has been particularly favourable to the insect vectors. It is hoped that the latter is the case, and that with a series of seasons of average rainfall, spotted wilt may revert to being only a minor disease of rare occurrence in these areas.

Sclerotium Stem Rot Caused by Sclerotium Rolfsii.

C. J. MAGEE, D.Sc.Agr., M.Sc., Chief Biologist.

SUDDEN wilting and death of plants are usually caused by an attack on their roots or the base of the stem by certain parasitic soil-inhabiting fungi. Some such fungi merely cause a rot of the outer layers of the roots or stem, leading to a form of ringbarking; others actually invade the sap-conducting or vascular system and block the passages or produce in them toxic materials which may lead to wilting and death.

There are a number of distinct types of soil-inhabiting fungi which can attack plants; *e.g., Rhizoctonia solani, Fusarium* spp., *Pythium* spp., *Phytophthora* spp., *Sclerotium rolfsii*, etc. The temperature of the soil and its moisture content determine to a large extent the parasitic activity of these fungi. Even under conditions favourable to a specific fungus, it is usually found that it can attack only certain kinds of plants or even only susceptible varieties of a plant, but there are some soil-inhabiting parasitic fungi which are very omnivorous in their parasitism, being able to attack a wide range of

Fig. 1.—Base of the Stem of an Antirrhinum Plant showing Spherical Sclerotia and White Mycelium of *Sclerotium rolfsii*.

different plant species. The fungus *Sclerotium rolfsii* is a notable example of this group.

During the summer months, when soil temperatures are high, *Sclerotium rolfsii* can be very destructive in those soils to which it has been introduced. This is particularly so following periods of heavy rain or heavy irrigation, as a high moisture content of soil as well as warmth favours the development of this fungus.

Sclerotium rolfsii is a very well-known plant pathogen in tropical and subtropical countries, and it is becoming increasingly widespread in farms and gardens in New South Wales. In this State it has been recorded attacking such widely different plants as antirrhinum, bean, beet, carnation, carrot, cauliflower, convolvulus, cotton, cowpea, chrysanthemum, daphne, eggplant, fig, grasses, hydrangea, potato, rhubarb, rockmelon, squash, sweet potato, tobacco, tomato, violet, watermelon, as well as apple, citrus and peach stocks.

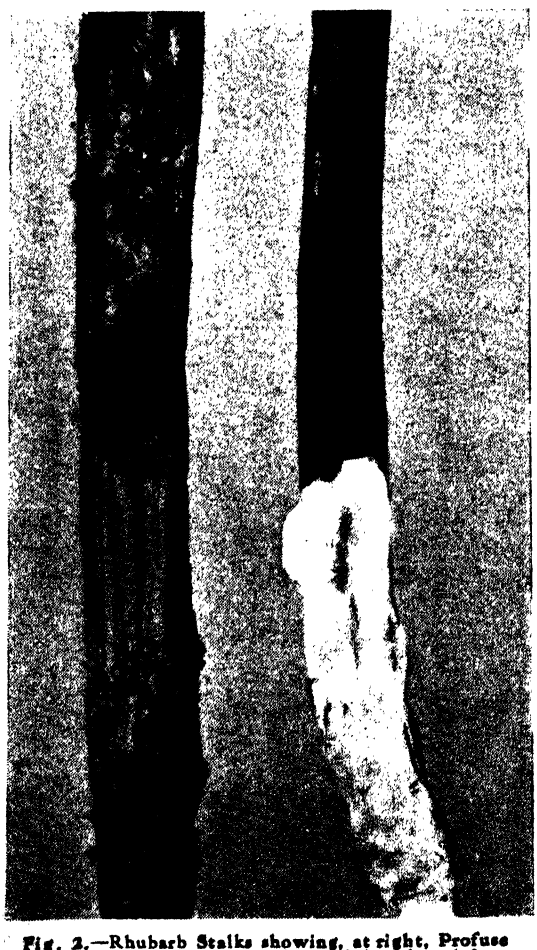


Fig. 2.—Rhubarb Stalks showing, at right, Profuse White Growth of *Sclerotium rolfsii*, and, at left, Spherical Resting Bodies, or Sclerotia, of the Fungus.

The type of disease caused by *Sclerotium rolfsii* is characteristic and is easily recognised. The fungus first atacks the stem near soil level, soon developing a prominent white mycelium or cotton-wool-like growth on the outer layers of the stem. As the cells in this area are killed, the fungus invades the roots and the mycelium extends out into the surrounding soil. The first indication of the presence of the disease is wilting of the leaves of the plant, which follows upon the ringbarking of the stem. Branches, leaves or fruits which touch the soil may be subject to independent invasion and rotting. The white mycelium of the fungus has a distinct radial habit of growth and as it matures it becomes dotted with white tufts which later develop into spherical resting bodies, or sclerotia, about the size of cabbage seed. These are at first white, but later become brown. The early development of the characteristic spherical sclerotia and the dense mycelium of radial pattern allows this pathogen to be readily identified.

Plants attacked by *Sclerotium rolfsii* are nearly always killed, but it is a feature of the disease that not all plants in an apparently uniformly infested area become infected. This is not regarded as being due to the individual resistance of the plants, but to local factors favouring infection.

The disease is most troublesome in soils rich in decaying vegetable matter, such as fallen leaves, and it is thought that local variations in this regard determine many infections. The susceptibility of different host plants appears to be related too to the extent to which they shade the soil and increase local humidity, so that shade also may play a part in determining individual infections.

Control Measures.

The resting bodies or sclerotia serve to carry over the disease from one summer to the next, producing new growth when conditions again become favourable. This provision for perennation makes *Sclerotium rolfsii* a particularly undesirable pathogen

and every effort should be made to exclude it from a farm or garden. Its most likely mode of entry is in introduced seedlings, soil or manure, and these should be given such scrutiny as is possible.

Following an outbreak of sclerotium stem rot in beds of ornamental plants and vegetables, some restrictions of the fungus may be obtained by drenching the soil at the base of infected plants with bluestone solution prepared by dissolving 1 lb. of bluestone in 10 gallons of water.

Diseased plants should be destroyed by burning and never added to compost heaps. There is evidence that *Sclerotium rolfsii* is able to develop profusely in compost heaps leading to prolific production of sclerotia that may later be distributed throughout a garden. Attention to surface drainage of the land, wider spacing of plants and the use of supports for climbing plants and plants of straggling growth habit, are considered as likely to assist in minimising losses from the disease in infested land.

On land known to be infested with sclerotia of the fungus, liberal use of sulphate of ammonia (dressings of 4 to 5 cwt. per acre) has been claimed in overseas countries to reduce losses from the disease and increase yields. It has become the practice in some parts of the world to sow infested soils with wheat or barley during the autumn and winter. This rotational cropping has been shown to result in a falling-off in the amount of disease carried over from summer to summer.

The Farm Home—*continued from page 259.*

Dissolve jelly crystals in hot water. When quite cool, but not set, whisk till light and frothy. Fold in the apple pulp and custard or cream. Colour if desired and pour into a mould to set. Serve with custard or cream.

Apple Gingerbread.—

10 oz. plain flour.
½ teaspoon bicarbonate of soda.
4 oz. butter or margarine.
4 oz. brown sugar.
4 tablespoons golden syrup.
1 egg.
1 cup apple pulp.
1 dessertspoon ground ginger.
1 oz. mixed peel.
½ teaspoon spice.

Rub butter into sifted dry ingredients, add sugar and peel. Combine beaten egg, golden syrup, apple sauce and add to the other ingredients. Mix lightly and pour into a greased shallow cake tin. Bake in a moderately hot oven 30 to 40 minutes according to depth of cake. Ice with lemon flavoured icing when cool.

Apple Cornflake Tart.—

4 cups cornflakes.
2 tablespoons sugar.
4 tablespoons melted butter.
Sweetened apple pulp.

Crush the cornflakes finely—should make one cup. Place in a basin with the sugar, add melted butter and mix well. Press this mixture firmly into the shape of the tart plate. Chill till quite firm or if preferred, crisp in a moderately hot oven 7 to 10 minutes. Cool and fill with the apple pulp. Decorate the top as required; *e.g.*, whipped cream, chopped nuts, coconut or just a sprinkle of cinnamon.

INSECT PESTS.
Notes contributed by the Entomological branch

The Cadelle Beetle (*Tenebroides mauritanicus*).

THE CADELLE BEETLE is a cosmopolitan pest of various grains and grain products, and its occurrence in New South Wales was first recorded in 1898, although it was probably here before that time. It is found in mills, granaries, storehouses, etc., usually in association with other pests of stored grain and foodstuffs.

These insects prefer dark situations, and are to be found beneath or between sacks or other containers in which their food materials are stored, so that unless they are disturbed they are not readily detected. Both larvae and adults are restless feeders and move about, feeding here and there.

The adults are predaceous as well as granivorous, and will devour the larvae of other grain insects, and even those of their own species. The larvae, however, are not known to be predaceous, but feed on a great variety of cereal products, grains (including wheat, maize, barley, etc.), and also on biscuits, bread, nuts, dried fruits and vegetables, etc. The kind of food eaten has a marked influence on the rate of growth of the larvae.

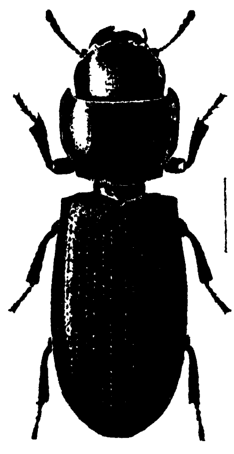
Where various grains are attacked, both larvae and adults prefer to feed on the "germs," and may move from grain to grain, thus damaging considerable quantities. The larvae may eat out all the inside of the softer parts of maize or wheat grains, leaving only a thin shell.

Sealed packets and cartons of various foodstuffs are normally free from attack by grain insects, but both the larvae and adults of the cadelle may eat through these containers and thus permit the entry of other injurious insects.

Description and Life-History.

The adult beetle, which measures about ⅜ inch in length, is shiny, and dark reddish-brown or black. It is elongate-oblong in outline and somewhat flattened.

The adults are long-lived and many have been recorded to live for more than a year. Egg-laying may begin about two weeks after the insects become adult, and may continue over a long period. An individual female is capable of laying about 900 eggs.



The Cadelle Beetle.

The eggs, which measure slightly more than 1/25 inch in length, are spindle shaped and opaque milky-white. They may be deposited either loosely or in clusters, in ground cereals or other materials, or may be placed in batches in crevices or grooves, in floor cracks or under loose flaps of packets or through the fabric of containers. Where the eggs are laid in batches, they are placed side by side, the average number in a batch being about twenty-five. The incubation period varies according to temperature, and may occupy from one to more than two weeks.

The minute young larva, which emerges through one end of the egg shell, is almost transparent. The fully-fed larva measures about 3/4 inch in length, and is whitish, elongate and somewhat flattened. It has a soft-skinned body, the head is dark and the first segment behind the head bears a dark chitinous shield. The tip of the abdomen bears a pair of characteristic, dark, pointed processes or pseudocerci. The larvae, when fully-fed, may travel considerable distances, and bore into soft wood or other materials to form a small chamber in which to enter their pupal or chrysalis stage. They may construct their pupal cells out of pieces of grain or debris cemented together with larval secretions, or may pupate in crevices or holes in bins, etc. In consequence of the wandering habits of the larvae at this period, many other stored products, not used as food by the larvae, may be entered, and, frequently, considerably damaged.

Where suitable food is available, the larva may change into a pupa in from three to seven months. Under unfavourable conditions a larva has been found to live for more than three years.

The pupa or chrysalis, which measures about 3/8 inch in length, is of a uniform, pale-creamy colour, the legs and developing wings being readily seen. The prepupal period in the cell lasts for about nine days and the pupal period from about eight days to a month.

The winter months are usually passed in either the adult or larval stages, and in cold climates the adults are more abundant during the late spring and early summer.

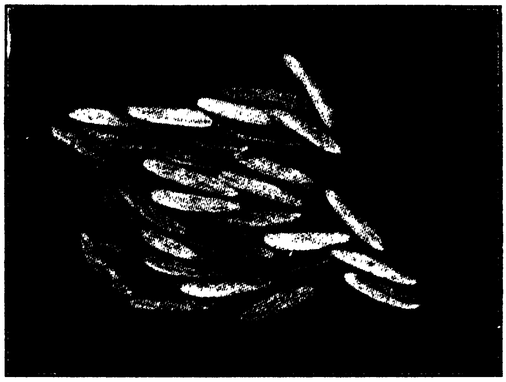
The life-cycle from egg to adult, completed during a single season, may be from about nine to nineteen weeks, but where the larva hibernates, the period may be from about thirty-nine to fifty-nine weeks. Under favourable conditions there may be two generations a year.

Control.

Both the larvae and adults are very resistant to starvation and are able to survive for considerable periods without food.

The eggs and pupae are readily killed by low temperatures, but the larvae and adults are very resistant and have been found to survive for several weeks at a temperature of 15 to 20 deg. Fahr.

Thorough cleanliness is essential where foodstuffs are handled or stored. All accumulations of dust from food products, waste materials, grains and such-like substances, should be kept off floors, benches, etc., as deposits of these left lying about may serve as breeding grounds for cadelle beetles and various other pests.



Eggs of the Cadelle Beetle, enlarged about 10 times.
[After Back and Cotton.

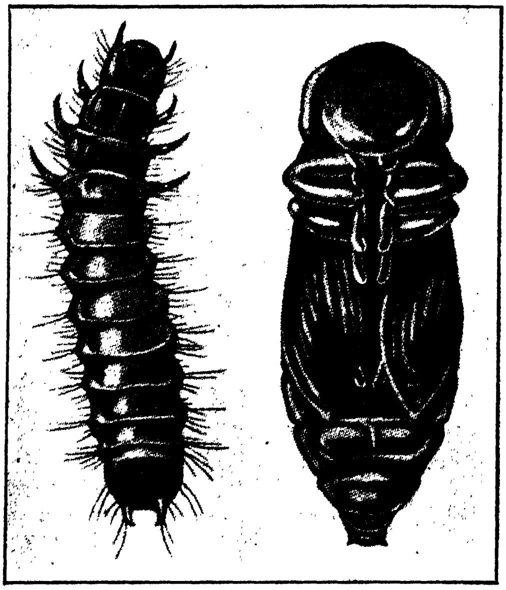
Owing to the habits of the larvae, of burrowing into the wood of floors, bins, partitions or into crevices, etc., when making their pupal cells, fresh insect-free materials may readily become infected if stored in places which have previously contained infested materials.

Hardwood should be used in preference to softwoods for the construction of bins or other containers, and the timbers should be closely-fitted. Any materials stored in them should be inspected at intervals for the presence of insects. The use of concrete bins for storage is one of the best means of preventing the rapid infestation of fresh materials.

Fumigation with carbon bisulphide or hydrocyanic acid gas may be resorted to for their control. Heating materials to a temperature of 120 to 130 deg. Fahr., for at least one hour will also kill all the insects present.

Where storage receptacles can be made gas-tight, carbon bisulphide is used at the rate of 5 lb. (approximately 3 pints) to every 1,000 cubic feet they will hold, no notice being taken of the actual amount of materials within. A silo or shed that holds 1,000 bushels of grain when full would have an air space of approximately 1,300 cubic

feet. For smaller containers the dosage will be in proportion. The liquid may be poured into a shallow tray on top of the materials or on to bags placed on top.



Larva and Pupa of the Cadelle Beetle.
[*After Back and Cotton.*

The gas, given off, which is heavier than air, should be allowed to act for twenty-four hours or longer. Where grain is required for seed purposes, the twenty-four hours should not be exceeded. After fumigation, the container or silo should be opened up to allow the fumes to escape.

Carbon bisulphide has the disadvantage of being higly inflammable and explosive, and to overcome this, non-inflammable carbon bisulphide mixtures, and mixtures of ethylene oxide and carbon bisulphide and mixtures of ethylene oxide and carbon-dioxide, ethylene dichloride and carbon tetrachloride have been prepared.

Hydrocyanic acid gas is effective in killing all stages of the beetle that may be exposed to it, but under ordinary fumigation this gas does not penetrate bulk materials to kill the insects within.

Warning.—Where carbon bisulphide is used, no light or fire of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.), must be allowed in or near sheds or buildings during the process of fumigation. The precaution should also be taken to cut off the electric current. Hot steam pipes have been known to cause explosion of this gas, and steam therefore should be cut off and the pipes allowed to cool before proceeding with fumigation.

Hydrocyanic acid gas is one of the most poisonous gases known and fumigation with it should only be carried out by an experienced operator.

The White Cedar Moth.

(Lymantria reducta).

DURING February and March the caterpillars of this moth occurred in large numbers on white cedar trees (*Melia azedarach*), in various districts, and in some instances completely defoliated them. Some persons were concerned with the possibility of other plants being attacked, but there appears to be no record of other than white cedars being damaged.

Fully-fed larvae, wandering in search of a place in which to spin their cocoons, were also reported to be entering dwellings in the vicinity of infested trees.

The larva or caterpillar, which may measure up to 1½ inches in length, is of a general dark-brown colour. The head is yellow, with darker markings in front, and the body is covered with long, grey and black hairs which cause irritation and inflammation of the skin to some persons when handling them.

During the day the caterpillars are usually to be found massed together about the base of the tree or a little way up the trunk. At night they climb up the tree to feed upon the foliage.

When fully-fed the caterpillars spin flimsy cocoons of silken strands, mixed with hairs from their bodies, either about the base of the tree, or amongst dead leaves, etc., on the ground. It is at this time that the larvae may enter buildings.

The pupa or chrysalis, which measures about ¾ inch in length, is brown, and bears a number of hairs. These hairs cover the

upper surface of the head and thorax, and encircle the abdominal segments.

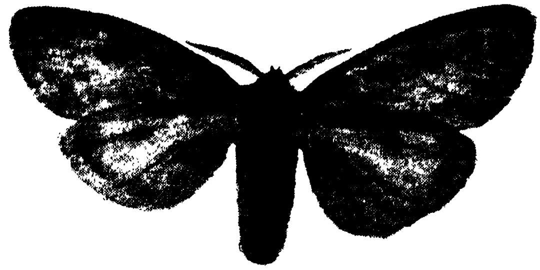
The moths, which have a wing expanse of about 1¼ inches, are light greyish-brown in colour. They occur in the Sydney district during late summer.

Control.

These caterpillars may be controlled by spraying the foliage with arsenate of lead at the rate of:—arsenate of lead powder, 3 oz.; water, 5 gallons.

Where trees are known to have been infested the previous season, a watch should be kept for the first signs of foliage infestation. A spray applied at this time will prevent defoliation of the tree.

Where the larvae are found about the base of the tree, they may be swept up and destroyed, or may be sprayed with a contact spray such as kerosene emulsion or a pyrethrum-kerosene fly spray.



The White Cedar Moth, about Twice Actual Size.

Praying Mantids.

(Mantidae.)

THIS group of beneficial insects is well represented in New South Wales; but usually, on account of their protective colouration, they are difficult to find when at rest.

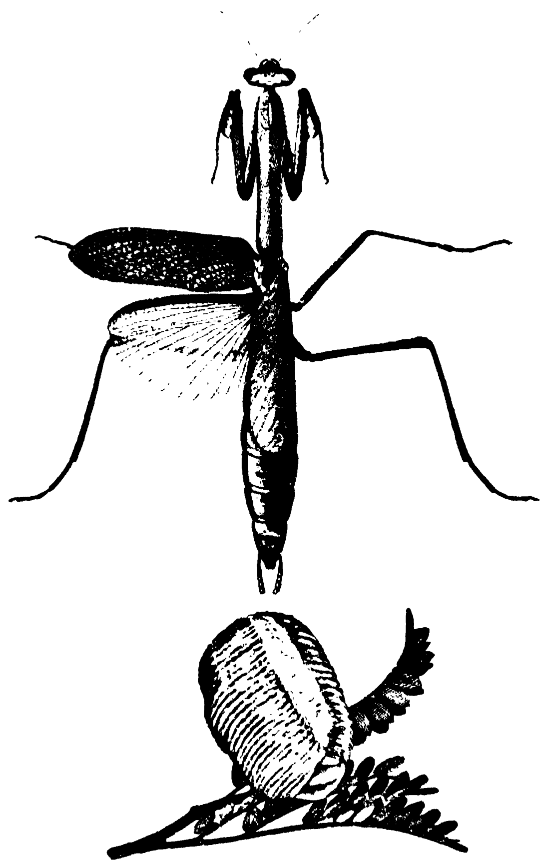
Mantids feed upon flies, moths, grasshoppers, etc., and as their food includes many injurious insects, they must be regarded as beneficial to man, and neither they nor their egg capsules should be destroyed.

Mantids are sometimes mistakenly thought by some to be stick insects (*Phasmatidae*) which feed upon the foliage of various forest trees, but an examination of the remarkable forelegs of the mantids will readily distinguish these beneficial insects from the injurious foliage-eaters.

They have a slender body, an elongate prothorax and a very mobile head with prominent eyes that assist in their search for prey. The head, seen from the front, is more or less triangular in outline. Their forelegs are very strong and heavily spined, and are specialized for seizing and holding other insects while devouring them.

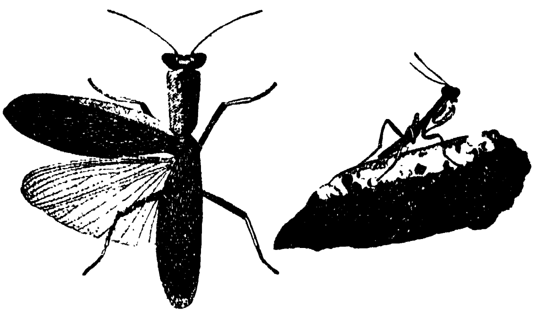
When at rest they stand high on their slender middle and hind legs, the forelegs being usually held closely folded beneath the prothorax ready to be quickly thrust out to seize an unwary insect.

Two of the larger species, most frequently observed, are the slender green mantid,



Adult Female of the Large Brown Mantid and its Egg Capsule.

Tenodera australasiae, which measures about $3\frac{1}{2}$ inches in length when mature, and the more thickset brown species, ***Archimantis latistylus,*** which measures about 4 inches in length when adult. The males of both these species are more slender than the females, and have well-developed membranous hind-wings which, when at rest, fold flat along the back and lie hidden beneath the tougher tegmina or wing-covers. In the females the wings are reduced in size and not adapted for flight.



Adult of the Broad-shouldered Mantid.
Egg capsule and young mantid on the right enlarged about twice actual size.

The eggs of both the above species are laid in a group attached to a twig or other object, and enclosed within a mass of foamy substance, secreted by the female, which dries to form a large capsule with a froth-like papery covering. As many as 215 young mantids have been recorded to hatch from one egg capsule.

The habits and food of the young mantids are similar to the adults. They grow by a series of moults, the wings appearing as small "wingbuds," which increase in size at each moult until they reach the winged adult stage.

Another species, which is not uncommon, is the "broad-shouldered" mantid, *Orthodera ministralis,* a light green insect which measures about $1\frac{1}{2}$ inches in length when mature. This species can fly quite well, but seldom does so, preferring to crawl around on plants in search of its prey. The egg capsule of this species, which is greyish-brown, is narrow and elongate and may often be seen attached to the bark of trees or on fences, stones, etc.

Some species of mantids are ground-frequenting forms.

At times, mantid eggs are attacked by small chalcid wasps, which, by means of their long ovipositors, penetrate through the protective papery covering of the capsule and deposit their eggs within those of the mantid. The wasp larvae develop within, and later, after passing through their pupal or chrysalis stage, become adult wasps which gnaw their way out through the papery covering leaving small circular exit holes in the capsule.

Some Important Considerations in Tank Sinking.

If there is much of a fall in the land, tanks should be made long and narrow across the fall. If the length were made parallel with the fall the water would reach the surface at the lower end while it was still very low at the upper end, and consequently much of the storage capacity would be lost. Where the site is level, a square tank is the most suitable.

Very steep sides are soon trodden down, mud and clay fall in, and the shape of the excavation is spoiled. This applies to tanks that are not fenced in and to which stock are allowed access all round. Sheep only should be watered at these, and the slopes should not be less than 3 to 1.

All excavations intended to be used for large stock should be fenced in, and access given at one side only, which is generally termed the roadway. This should have a grade of from 4 to 1 to 5 to 1, and should be corduroyed or stone-pitched—the latter is more lasting and safer in every way. This can be done by making an excavation 7 to 8 inches deep, filling in with large stones placed on edge, all interstices being tightly wedged with small stones to an even surface and then blinded with gravel a few inches deep.

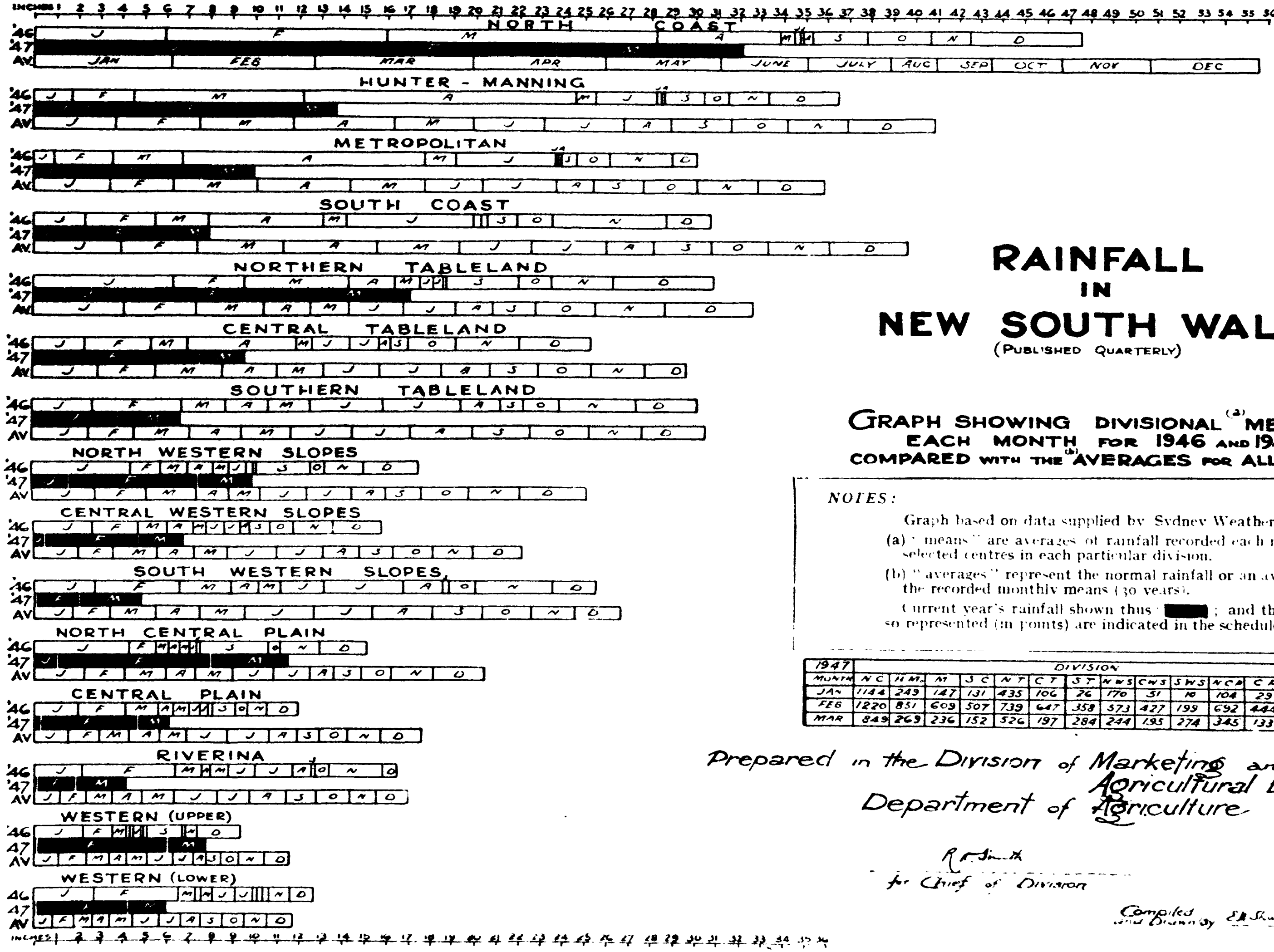
The desirability of sinking tanks of adequate capacity and of good depth cannot be too strongly stressed. Too often one sees tanks which could best be described as "pot holes." They might serve as suitable watering places, but only provided adequate rains are consistently received. During dry spells they rapidly dry out and become useless. A 2,000-yard tank should be the minimum excavation, except in very rare cases.

The departmental pamphlet ("Sinking of Tanks and Dams") from which the foregoing paragraphs are taken is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

RAINFALL IN NEW SOUTH WALES

(PUBLISHED QUARTERLY)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1946 AND 1947 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS.



NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means (30 years).

Current year's rainfall shown thus ▬; and the figures so represented (in points) are indicated in the schedule below

1947	DIVISION														
MONTH	N C	H M.	M	S C	N T	C T	S T	N W S	C W S	S W S	N C P	C P	RIV.	W U	W L
JAN	1144	249	147	131	435	106	26	170	51	10	104	29	11	12	6
FEB	1220	851	609	507	739	647	358	573	427	199	692	444	174	592	423
MAR	849	269	236	152	526	197	284	244	195	274	345	133	230	174	164

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

R. F. Smith

for Chief of Division

Compiled and Drawn by E. R. Shannon

The Competition Pens at Hawkesbury Agricultural College.

Poultry Notes.

May, 1947.

E. HADLINGTON, PRINCIPAL LIVESTOCK OFFICER (Poultry).

Comments on the 1946-47 Egg-laying Competition at the Hawkesbury Agricultural College.

ONE of the most pleasing features in the results of the laying test just concluded is the improvement in the general average production from 195.17 eggs per hen last year to 204.4 this year. This is all the more satisfactory, considering that several changes had to be made in the ration fed owing to the shortage of foodstuffs.

Breed Averages.

The highest average for any breed (216.33 eggs per hen) was put up by the one pen of Anconas. This was followed by Australorps with an average of 207.81 and White Leghorns with 204.31; Langshans 202.05 and Rhode Island Reds 183.67.

Egg Weights.

There was an improvement in weight of eggs this year compared with last year, as shown hereunder:—

1946-47.

	Individuals. No.	Per cent.	*Groups.* No.	Per cent.
Light Breeds	26 =	7.2	10 =	6.6
Heavy Breeds	18 =	10.0	5 =	16.6

1945-46.

	Individuals. No.	Per cent.	*Groups.* No.	Per cent.
Light Breeds	38 =	10.3	15 =	25
Heavy Breeds	32 =	18.0	10 =	33

Mortality.

There was practically no difference in mortality as compared with last year, the figures being 8.3 per cent. this year and 8.5 per cent. last year. This figure is much lower than is the case in many overseas competitions and is about the level expected amongst well-managed flocks of pullets on commercial farms.

Chief Prize Winners.

The major prizes went to Messrs. C. A. Clark and Son who won the Grand Champion Prize for highest market value of eggs, the Golden Egg for quality and production, also prizes for the highest group score in the competition and the highest individual score in heavy breeds as well as several other prizes.

Although Messrs. Clark and Son have been amongst the prize winners before, this is the first occasion on which they have carried off the most coveted trophies, and as their pen of birds led almost from the beginning of the test the win is well merited.

Both the Grand Champion and Golden Egg consolation trophies went to Mr. W. F. Argall, whose pen of birds laid 1,439 eggs, having a market value of £9 1s., and scored 91.9 points for quality and production.

Full Report of Egg-laying Competition.

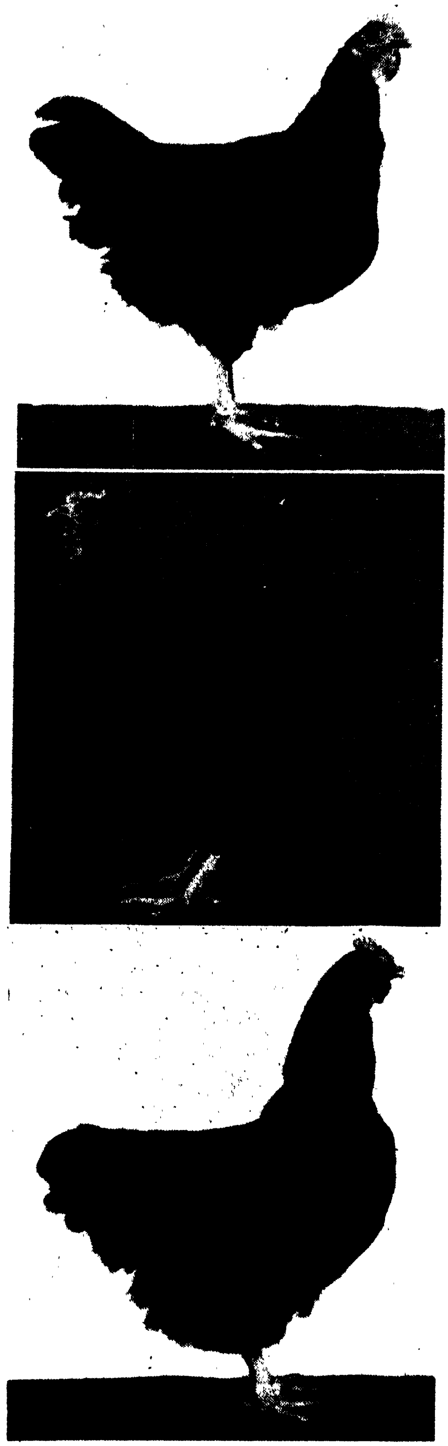
FULL details of the 1946-47 Hawkesbury Agricultural College Egg-laying Competition are available in leaflet form and will be supplied on application to the Department of Agriculture, Box 26A, G.P.O., Sydney.

Financial Side of the Competition.

The figures show that the gross return per hen over the whole competition was 26s 3d., and after deducting cost of feed (9s. 5d.) based on Sydney prices plus 10s. per ton delivery, the net return is 16s. 10d. per bird, which is practically the same as last year. This, however, should not be taken as applicable to commercial farms, as the birds in the competition are all pullets

One of the Group of White Leghorns entered by Mr. W. F. Argall.

This group won the Grand Champion Consolation and the Golden Egg Consolation Trophies.



Three of Messrs. C. A. Clark and Son's Group of Australorps.

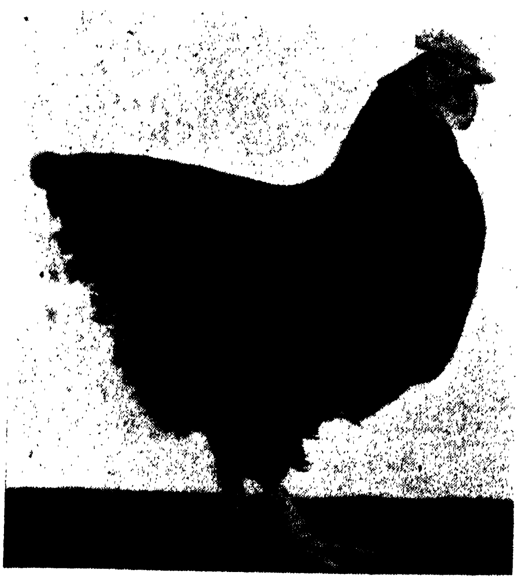
Winners of the Grand Champion and the Golden Egg, also prizes for the highest group score in the competition, the highest individual score in heavy breeds and several other prizes.

The hen in the centre put up the highest individual score in heavy breeds.

and production is considerably higher than from commercial flocks. Moreover, most commercial farmers have had to pay much

White Leghorn of the Group entered by Wimbleford Poultry Farm.
This group won the James Hadlington Commemoration Medal.

Mr. L. Heathfield's White Leghorn Hen, which won the Prize for the Highest Individual Score in the Light Breed Section.



One of the Group of Australorps, owned by Messrs. Campbell and Kinnish, which won the D. R. Dove Memorial Prize—Awarded under the same Conditions as the James Hadlington Commemoration Medal.

higher rates for all foodstuffs, which, it is estimated, would increase the cost of feeding to 10s. 10d. per bird.

On the basis of flocks laying an average of twelve dozen eggs per hen per annum, which is accepted as a fair production from hens and pullets, the return per hen would be lower than in the competition and would not exceed 17s. 6d. After deducting 10s. 10d. for cost of feed, this reduces the return to 6s. 8d. per bird as compared with 8s. 9d. last year.

Write to the Department of Agriculture, Box 36A G.P.O., Sydney, for copy of folder telling of the free services available from the Department and how you can obtain those services.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingah.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingah State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

114 A.G.H., Kenmore.
Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., " Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	46
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167
Hann, O., " Bomerah," Barrington (Jerseys)	55
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., " Meryla," Culcairn	65
Hill, E. Pritchard, Bowling Alley Pt. (Jerseys)	96
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., " Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., " Narooma," Urana-road, Wagga (Jerseys)	127
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	101
New England Experiment Farm, Glen Innes (Jerseys)	46
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, F. S., Calool, Culcairn	80
Reid, D. B., " Evandale," Sutton Forrest (Aberdeen-Angus)	24
Reid, G. T., " Nareogullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H. " Turanville," Scone (Polled Beef Shorthorns)	114
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	9
Scott, A. W., " Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., " Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Yanco Agricultural High School	64
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
114 A.G.H., Kenmore	49
Callan Park Mental Hospital	47
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale	62
Gladesville Mental Hospital	9
New England University College, Armidale	20
Orange Mental Hospital	61
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixson, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hann, O., Bomerah, Barrington	55	8/8/47
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrcshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Lidcombe State Hospital and Home (Friesian)	98	10/10/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Navua Stud Farm, Grose Wold, vi a Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	46	18/3/47
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station ...	19	29/4/47
Weatherlake, J., "Bransome," Camden ...	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	110	16/3/47
Yanco Agricultural High School, Yanco ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
114 A.G.H., Kenmore	52	26/6/47
Aboriginal Station, Wallaga Lake	19	29/4/47
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	20	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	80	4/2/49
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
Marist Bros. College, Campbelltown	70	3/1/48
McGuffické, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	19	1/5/47
O'Brien, O. "Mount View," Inverell .	18	9/2/47
Orange Mental Hospital	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weatherlake, J., "Bransome," Camden ...	7	14/3/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia ..	162	26/4/47

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Horse-breeding Act Suspended.

THE Horse-breeding Act, 1940, has been suspended until 1st February, 1948.

Up to 1st February, 1947, provisions of this Act requiring owners of stallions to notify the Department of Agriculture in the event of transfer, castration or death of any stallion have been enforced, although other sections of the Act have been suspended since 1942.

All provisions of the Act have now been suspended until February next, which means that stallion owners are *not* required to advise of transfer, etc., as mentioned above.

Manurial Value of Sewerage Sludge.

ALTHOUGH analyses of dry sewerage sludge from several New South Wales towns show considerable variation, it may be said that sludge has the following average composition:—

	Per cent.
Moisture	7.0
Organic matter	35.0
Mineral matter	52.5
Nitrogen	3.0
Phosphoric acid (P_2O_5)	2.0
Potash (K_2O)	0.5

On these figures one ton of average sludge would contain the following weights of material:—

	lb.
Moisture	156.8
Organic matter	784.0
Mineral matter (ash)	1,176.0
Nitrogen	67.2
Phosphoric acid (P_2O_5)	44.8
Potash (K_2O)	11.2

The organic matter in sludge is relatively rich in nitrogen but unfortunately only about one-third of the sludge is organic matter. Mineral matter constitutes at least half the weight of sludge. It is chiefly inert material with very little manurial value.

The phosphoric acid in one ton of sludge is approximately equal to that contained in 250 lb. of 18 per cent. superphosphate. The phosphoric acid is not water soluble and it is doubtful whether it is readily available to plants.

Sludge is usually very acid and this condition can be remedied by mixing about 56 lb. of ground limestone or, better still, dolomite, with each ton of finely ground sludge. Sludge usually occurs in a coarse lumpy form. The material is tough and is difficult to reduce to a fine state of division.

—E. GRIFFITHS, Chief Chemist.

Importance of Paving and Draining Dairy Yards and Approaches.

DAIRY yards and their approaches and exits should be heavily stoned in order that a foundation may be obtained which will not break up in wet weather and become a bog, or in dry weather create clouds of dust that are both a nuisance and a menace. Large stones should be laid down first, and on top of these finer metals or coarse river bed gravel and pebbles. The bigger stones are necessary for a foundation, because after heavy rain small material is trampled into the soil and sinks out of sight, permitting the surface to become a quagmire.

Where cattle pass through gateways there is always a crush and a rush, and it is therefore important that such approaches and exits should be dealt with just as carefully as the yards themselves. The surfaces of all yards and approaches require to be graded to facilitate drainage, and should be kept even, in order to prevent the formation of holes that will contain water. On flat country it may be necessary to provide underground drains; that is, trenches dug to a depth of 2 feet and, say, 1 foot wide, and graded to permit the soakage to get away. Filled with stones and rubble, they serve the purpose admirably.

Yards and approaches require constant care, as they are continually being worn by the cattle passing over them. If allowed to fall into disrepair they soon become in a very bad condition, necessitating a large expenditure of time and labour to bring them back to a satisfactory state again.

Comparative Merits of Cavendish and Viemama Bananas.

MANY inquiries are received by the Department every banana planting season as to whether the Cavendish variety or an intermediate variety such as Williams Hybrdi, Mons Marie or Viemama (all more or less alike) is the best variety to grow.

To decide this important point, the Division of Horticulture tested out the Viemama variety against Cavendish, the standard commercial variety, for a number of years under comparable conditions at the Duranbah Experimental Plot, near Murwillumbah, an area under the direction of the Department but financed by the Banana Growers' Federation. Field production records were kept, including such particulars as the number of bunches harvested, weight of bunches, weight of stalks, and weights of culled fruit and marketable bananas.

Over 700 bunches of both varieties were recorded. The average weight of the Cavendish bunches was 40.41 lb. and that of the Viemama bunches 39.76 lb. The Cavendish stalks averaged 3.6 lb. and the Viemama stalks 3.53 lb.

There was less cull fruit per bunch with Viemama, the amount being .7 lb. as against .95 lb. with Cavendish. Slightly more marketable fruit was packed from Cavendish bunches, which averaged 35.86 lb. as against 35.53 lb. for Viemama bunches.

Renovation of Paspalum Pastures.

FARMERS contemplating top-dressing paspalum pastures this autumn would be well advised to carry out a vigorous mechanical treatment to correct the sod-bound condition of the paspalum before applying the fertiliser. Only in this way can maximum results be obtained.

Many of the failures to obtain a satisfactory response to fertilisers on sod-bound paspalum and other pasture areas have been due to the paddocks being in an unsuitable condition to produce results. The first essential operation is to clean off any long growth of grass and dry trash from the paddocks. Unless this is done, renovating implements and grass-harrows will not do effective work. Areas require to be worked with a disc cultivator, stump-jump paspalum renovator or some other form of pasture cultivator. The amount of work necessary to renovate an area satisfactorily will depend on the condition of the pasture; in the case of badly sod-bound paspalum two workings from 3 to 4 inches deep will be required, the second working to be at right angles to the previous one.

Where ground carbonate of lime is used, it can be spread with the fertiliser distributor just prior to distributing the fertiliser. After the fertilisers are applied a pasture harrow should be run over the area to complete the work. Subsequent workings of the paddocks should be made with the pasture harrow after each grazing period, in order to distribute animal droppings, collect and remove dry grass, and create a light, surface soil mulch.—J. N. WHITTET, Chief Agrostologist.

Cause of Ropy Bread and Measures for Prevention.

THE disease known as "ropiness" in bread, the prevalence of which was recently referred to in the press, often occurs in isolated bakeries in January and February, but the warm and humid weather lately prevailing has apparently been particularly favourable to it.

The defect is caused by infection of the flour by *Bacillus mesentericus*, a soil organism, with which grain is usually contaminated before milling. The bacillus is a resistant spore former, and is liable to survive in bread during the high temperatures of baking. Although oven temperatures are very high, the temperature in the centres of the loaves does not normally reach 100 deg. Cent. in ordinary baking.

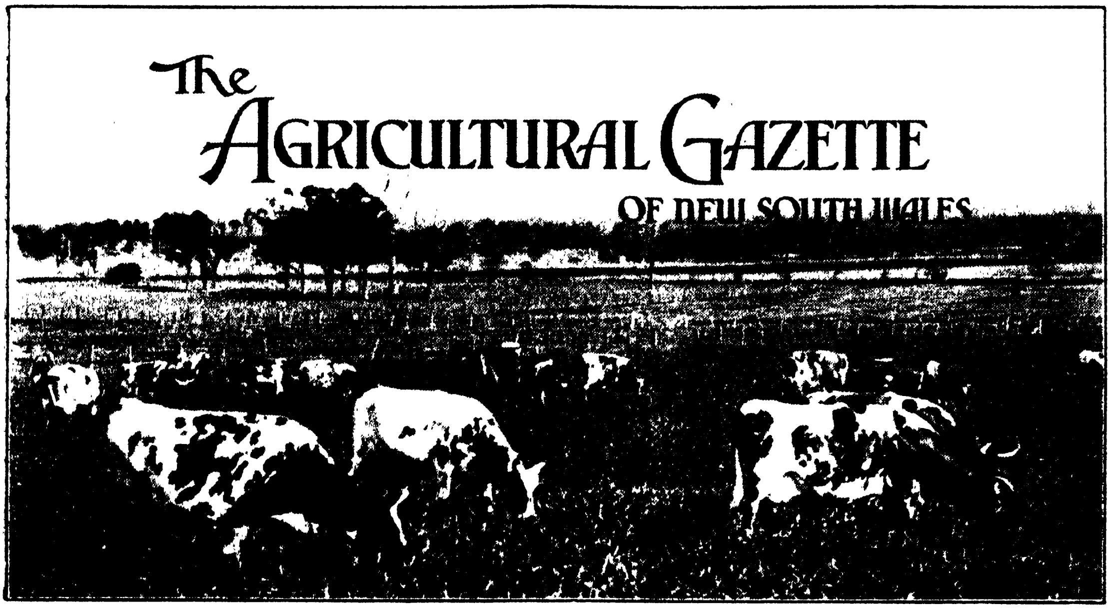
It is now generally agreed that *Bacillus mesentericus* is present to some extent in all flours, being most common in those containing much bran, and, unless particularly high, is of little significance in determining the incidence of outbreaks of ropy bread. Of greater importance are the procedures of dough making and the manner of bread cooling after baking.

Investigations carried out by the Biological Branch of the Department indicate that good quality flour often becomes heavily contaminated with the bacillus during the sifting process by dirty, inaccessible filters and conveyors, and in the bread troughs where routine cleaning is neglected. During the war years, too, the use of second-hand bags which were improperly laundered before re-use sometimes led to heavy contamination of flour. In many cases the method of cooling of the loaves after baking is at fault. The storage of large quantities of hot bread in an enclosed space in hot weather will provide ideal conditions for rapid development of the ropy organism.

The procedure recommended to bakeries when an outbreak of ropiness occurs is the temporary use of vinegar or dilute acetic acid in the dough mix (1 pint of vinegar or 4 per cent. acetic acid per bag of flour), followed by a thorough overhaul of the flour line and mixing troughs, and attention to the conditions of storage of bread during cooling.—BIOLOGICAL BRANCH.

THE AGRICULTURAL GAZETTE FOR JUNE, 1947.

This Issue Contains:—



Editorial—

Refresher Courses for Ex-Servicemen.

EX-SERVICEMEN who have been awaiting the opportunity of re-equipping themselves for the task of again taking their place as primary producers, as well as all those interested in the welfare of these men, will welcome the announcement by the Hon. E. H. Graham, M.L.A. (Minister for Agriculture) that a commencement is to be made next month with Commonwealth Reconstruction Training Scheme farm management refresher courses for New South Wales men from the services.

The tremendous task of producing great quantities of food during the war years when the labour available for the purpose had to be kept at a minimum so as to enable the fighting forces to be kept at the greatest possible strength, resulted in great changes in agricultural methods—particularly in the mechanisation of farm operations—and many new types of implements are now in use.

During recent years also much has been learned of the need for the conservation of the fertility of our soils, and the importance of keeping suitable records to ensure sound economic management has been brought home to farmers.

Instruction in these and many other aspects of primary production which have altered in the past five or six years will be of great interest and value to young men returning to a life on the land.

The syllabus, which has been prepared by the Department of Agriculture, covers a wide range of subjects and the most up-to-date methods of instruction will be employed. Ex-servicemen will have an excellent opportunity to learn the latest developments in their particular branch of agriculture.

Each course will be divided into two parts, each of four weeks duration. During the first four weeks the student will take general agricultural subjects such as elementary animal production, elementary veterinary science, plant production, climate and soil, etc. In the second part he will be required to specialise in one of the following groups at his own choice: (1) Sheep, fat lambs, crops and pastures; (2) dairying; (3) horticulture; (4) pig raising; (5) poultry raising.

A special feature of the course is to be the emphasis placed on farm management and elementary farm economics, and lectures on this subject will be given throughout the whole course.

Riverina Welfare Farm, Yanco, is to be the main training centre, but it is intended to use Wagga Experiment Farm, where facilities are already available, for the first few courses until the accommodation being provided at Yanco is ready.

It is expected that the first course will start at Wagga Experiment Farm on 14th July and the second also at Wagga on 22nd September. After Christmas, the School will move to Riverina Welfare Farm, Yanco, and the third course will commence there about 5th January. Subsequent courses will continue until the end of the year.

Students will be entitled to receive pay and allowances at C.R.T.S. rates and to free travel to the School. Application should be made as under:

1. Ex-members who have been successful in a land ballot under War Services Land Settlement—

The Returned Soldiers Settlement Branch,
Department of Lands,
Sydney.

2. In all other cases to—

The Commonwealth Reconstruction Training Scheme,
Grace Building,
York Street,
Sydney.

Intending applicants should indicate the course most suitable to them and the specialist group they desire to join.

Hon. E. H. Graham, M.L.A., Again Minister for Agriculture.

AT a welcome to Hon. E. H. Graham, M.L.A., following his re-appointment as Minister of Agriculture for a further period of three years, officers of the Department of Agriculture spoke of the constructive work carried out by Mr. Graham in his previous term of office and promised their continued loyalty and support.

Expressing his appreciation of the sentiments expressed, Mr. Graham said he knew very well that a Minister could only secure the best results with the wholehearted support of the Departmental staff—which he was happy to have had—and he looked forward to its continuance.

Mr. Graham said that his present immediate aims were to complete the projects commenced during the Government's last term. These included the construction of country killing works at Dubbo, Goulburn, Gunnedah and Wagga, and raising the standard of the various Experiment Farms and Colleges to a level at which the State could be proud of them. A start had already been made with the farms, and the new cannery and dairy factory would improve the facilities for instruction at Hawkesbury Agricultural College. At the Wagga Experiment Farm renovation and remodelling was taking place, so that instruction could be given, first to the returned servicemen students taking refresher courses, and subsequently to students taking the first year of their Hawkesbury College Diploma Course. The Riverina Welfare Farm was also being renovated, so that early next year the whole of the Department's rural training activities for ex-servicemen could be carried on there.

"Departmental staff are still not sufficient in number to meet the demands made on their services, but this position is progressively being rectified," said Mr. Graham. "It is very pleasing that the Department is held in such esteem throughout country districts and that there exists this strong demand for the services of Departmental officers, and every endeavour will be made to provide the necessary staff."

The Minister referred also to the extension of the Department's artificial insemination activities; the wool research work being undertaken at Trangie Farm in co-operation with the Council for Scientific and Industrial Research, in which the services of Dr. McMahon, who recently arrived from New Zealand, were being utilised; the survey being undertaken throughout the State to determine requirements of wheat grain silos, and the progress of the tick eradication campaign.

Quick Freeze Methods.

Research Officer Visiting America.

AN officer of the Department of Agriculture, Mr. Stephen M. Sykes, Assistant Fruit Research Officer, left recently for U.S.A. and Canada to investigate advanced methods in those countries of quick freezing of fruits, vegetables and other foodstuffs, such as meat and fish.

Announcing this the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said the Government was interested in developing the "frozen pack" method of food preservation, and consequently had decided to investigate latest quick-freeze developments in U.S.A. and Canada. In those countries that method of food preservation had developed rapidly in recent years.

Mr. Sykes would inquire into the latest types of equipment used, varieties of fruits and vegetables most suitable for quick freezing, and types of containers used, and would also study the quick freezing of other foodstuffs. Information collected by Mr. Sykes would prove valuable to commercial interests, local research bodies and householders, said Mr. Graham.

Solving Crop and Pasture Problems.

Work of Division of Plant Industry.

THE problems of the farmer largely determine the functions of the Department of Agriculture—for the Department aims to assist, whatever the problem. The Department is divided, for the sake of specialised and convenient administration, into a number of divisions. Each deals with a separate rural industry or interest, but the activities of these units are co-ordinated so that the problems are viewed from their widest aspects and with all their implications.

The purpose of this article is to set out the services which the Division of Plant Industry provides in helping farmers to solve their problems in relation to crop production, with which must be considered the related interests of land tenure, land utilisation and farm management.

The days when land was cheap and easily acquired have gone. Practically all the good land of our country has been taken up. Much of this land and some of the less fertile land has been so intensively or unwisely farmed that a great deal of our capital asset in soil fertility, or even the very soil itself, has been lost.

Inadequate size of holdings, misdirected land settlement, misuse of land, rising living and farming costs and restricted markets all have created problems—technical, economic and social—for the farmer. These problems present a challenge to develop an organisation to meet the altered and increased demands. The Department of Agriculture is the Government's answer to that challenge.

Work of the Division of Plant Industry—and of most of the other Divisions of the Department—comprises research, educational, advisory and regulatory activities.

It has become evident that provision of a scientific basis (by research, investigation and experiment) and of a practical basis (experience) for technical advice on crop production is not sufficient to meet the farmer's present need. He also wants assistance with many other economic problems related to the management and conservation of his farm and to the social aspects of his life as a farmer. To render this

service is the aim of the Division of Plant Industry.

Research on Crops and Pasture Plants.

The progress of agriculture depends very largely on the success of agricultural research. Research on crops and pastures comprises investigation and experiment to discover, evolve and test improved varieties and better methods, which will lower production costs, improve soil fertility and plant nutrition and improve the quality of the products so as to enhance their value for stock feeding, industrial use, human consumption, and such purposes.

Much of the work is long-range, and involves expense and uncertainty which cannot usually be faced by private enterprise. It is for this reason that the Department has established experiment farms or research stations at which the Division carries out this work. For the relatively small outlay required, probably no line of agricultural research pays such handsome dividends as the breeding of better plants.

Educational and Advisory Work.

As part of its educational programme the Division of Plant Industry provides general agricultural information, particularly in relation to crop production, pastures, soils, etc. This it does through a staff of Agricultural Instructors stationed throughout the farming areas of the State, and whose services are available to farmers.

The Division is responsible for the practical application of agricultural science and research to crop production problems on the individual farm. Originally, this educational work was limited mainly to technical information; now it covers such broader phases of farming as farm management, land utilisation, soil conservation, farm finance, etc.

Agricultural problems, however, are not confined to the individual farm. Many problems in land utilisation, crop production, crop adjustment, soil conservation, flood control, farm tenure, etc., call for mutual co-operation between farmers themselves, and, in turn, the State. The Division encourages and helps farmers to form groups to cope with such problems, and eventually to take independent action amongst themselves or in co-operation with the State.

One of the Blocks of the Quarters at Wagga Experiment Farm.

The advisory work of the Division goes still further in assisting farmers toward solving such economic problems as stable prices for farm products, loans for crop production or storage, measures for drought and flood relief, improvement of farm credit, rural rehabilitation, stability of agricultural industries, etc.—before these matters are dealt with finally at the administrative level.

Organisation for Extension Work.

The Department's educational work is based largely on the results of investigation and experiment on the Department's farms and on private properties. The Department, however, has by no means a monopoly of agricultural knowledge

derived from research. Many farmers themselves are experimenters. In every district there are a few highly successful farmers with very good local knowledge and experience. Extension of this pool of farmer-experience throughout the district serves greatly to elevate the general standard of farming and rural living.

Agricultural extension, however, is not confined merely to giving the farmer technical knowledge that will enable him to farm more efficiently and to increase his income. It includes also guidance as to ways in which the standard of the social, cultural and recreational life of rural people may be improved, and their talents for leadership in all these respects developed.

Extension is achieved mainly through personal contact—as far as possible with the farmer on his farm—but the Instructor also uses press publicity, circular letters, individual correspondence, radio talks, lectures, demonstration or experiment plots, field days, exhibits, departmental publications, etc., to achieve his purposes.

The Agricultural Instructor has an office at his headquarters town, and, when not away on field duties, he is available for interview by district farmers. As far as possible, contact is made with individual farmers by personal visits to their properties, but many inquiries are also answered by telephone and letter.

The organisation of extension work is also undertaken to a large extent through groups of farmers, such as branches of the Agricultural Bureau, Farmers' and Settlers' Association, Graziers' Association, etc. Field days are organised through such bodies.

In addition to his work among farmers and their organisations, the District Agricultural Instructor works in liaison with and supplies technical advice to many organisations whose activities concern farming. In this way his services are available to municipal and shire councils, land settlement and rural rehabilitation authorities, other Government Departments who spheres are closely related to agriculture, and to similar organisations, and his knowledge of the activities of these organisations is, in turn, of value to the farmers of his district.

Farmers keenly interested in Field Day Demonstration.

Regulatory Work.

Officers of the Division of Plant Industry administer the provisions of several Acts, the chief purpose of which is to prevent losses in agricultural production. By enforcement of certain measures farmers are protected from the need of carrying out costly and difficult remedial measures.

Examinations of seeds under the provisions of two Commonwealth Acts—the Plant Quarantine Act and the Customs and

(*Continued on page* 288.)

THE EARLY POTATO CROP

Some Points for Growers.*

A. C. ORMAN, H.D.A., Special Agricultural Instructor.

THE early potato crop is a very important one in New South Wales because it is usually marketed during a period when supplies from other sources are insufficient to meet requirements. Growers of early potatoes are now giving some thought to the planting of the coming crop, which normally commences in June and continues until about August, according to the district.

Those growers who propose planting early potatoes should take immediate steps to secure seed from tableland districts. The degree of success which might be achieved is influenced, not only by the quality of the seed used, but also by the manner in which the seed is prepared for planting. In the first place, it should be remembered that the quality, or productive capacity, of potato seed cannot be determined by its appearance; what counts is the breeding and history of the crop which produced the seed.

The Importance of Good Seed.

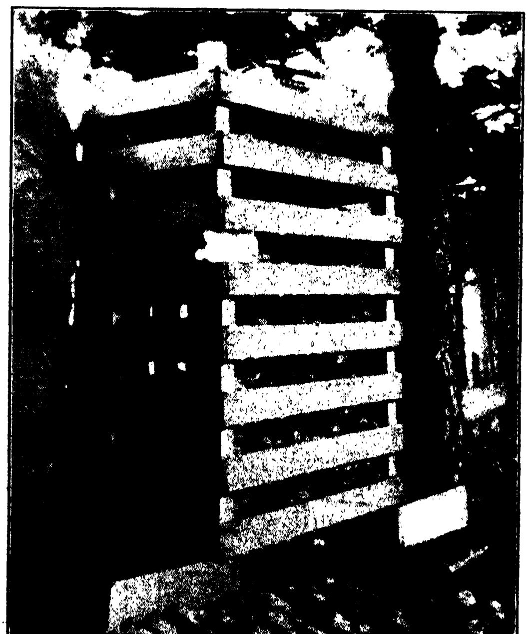
Now it might well be asked—"Why are some lines of seed better than others?" The value of seed is determined by its capacity to return high yields of marketable tubers, and the cause of lack of vigour is mostly the presence of virus disease in the seed. All virus diseases (of which there are many), although presenting different symptoms, have the effect of reducing the vitality and yield of the plants. Virus-infected tubers are usually smaller, smoother and possess shallow eyes, giving the potatoes a very attractive appearance. The disease is carried in the tuber, and is spread by planting infected tubers, as well as in the field by aphids; virus seed is bad seed.

In order to safeguard against planting virus seed, growers should use blue label certified seed, which is the progeny of crops which have been inspected by officers of the Department of Agriculture and found to be of high standard as regards freedom from disease, vigour and varietal characteristics. Certified seed is virtually guaranteed, and no grower can afford to take the risk of planting seed of unknown quality. The significance of certified seed is apparent when it is realised that the planting of virus-infected seed may result in a 25 to 30 per cent. reduction in yield.

*Adapted from a recent broadcast.

Dipping Seed to Control Disease.

Early growers should endeavour to secure their seed at least one month before it is to be planted, so that it may be dipped and effectively greened. The dipping of unsprouted seed in an acidulated corrosive sublimate solution or in organic mercury dips, to control rhizoctonia and scab diseases which are both tuber and soil borne is a wise precaution. Rhizoctonia especially is a serious disease in coastal districts during wet seasons.



"Greening" Potato Seed Tubers in Trays.
This practice is strongly recommended by the Department.

Acidulated corrosive sublimate is poisonous and must be handled carefully. To prepare 25 gallons of the solution, 4 ozs. of corrosive sublimate are dissolved by stirring in 2 pints of hydrochloric acid in a glass or glazed earthenware vessel. This stock solution is then diluted with water in a wooden barrel, trough or vat so that the final volume is 25 gallons. The seed should be treated for 10 minutes, then immediately spread out thinly on a slatted floor to dry. Rapid drying is important, otherwise germination may be affected. A leaflet giving full details of this treatment may be obtained free on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Green Sprouting Has Many Advantages.

The green sprouting of seed potatoes prior to planting should be of particular interest to coastal growers, as this practice promotes earliness of emergence and a more rapid early growth of both foliage and tubers. Green sprouting also enables the young sprouts to better withstand the attack of soil-inhabiting diseases such as rhizoctonia. Handling the seed in this way provides an opportunity to discard seed with weak shoots.

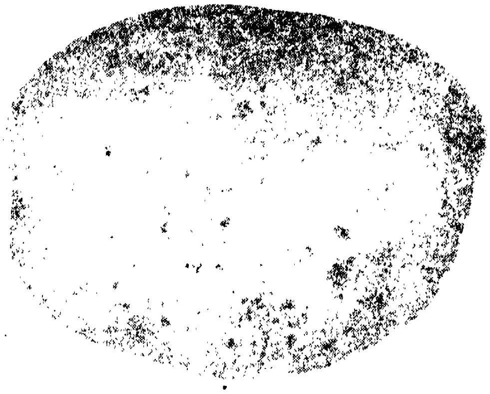
Perhaps the most important advantage of greening is that the yield per acre of marketable tubers is usually increased, due to the setting of the tubers under more favourable conditions, as a result of the earlier development of the plant. It must be admitted that an earlier and more vigorous growth and a greater yield are important considerations to the grower.

It would be interesting to know how many growers green their seed. My experience is that most growers, on obtaining seed, store it in bags in the barn until planting time arrives. By this time the seed has usually developed long, delicate, spindly sprouts, which either fall off or are broken off during handling, thus delaying emergence.

Green sprouting of seed is easy and inexpensive. It merely involves exposure of the uncut seed tubers in thin layers to subdued light for the purpose of developing short, tough, sturdy green sprouts. The floor of a well-lighted barn or hay shed is quite suitable for greening potato seed, provided the seed is protected from damage by mice and rats. In an emergency seed may be green sprouted under a densely foliaged tree. With good conditions seed may be effectively green sprouted in about four weeks.

Cutting the Seed.

Although there is always some risk of an uneven stand by planting cut seed, because



Typical Tuber of Sebago Potato.

of rotting of the seed piece, the risk is not very great when planting is carried out in a well-prepared moist soil during the cooler months; thus cut seed may be safely used for the early crop. It is important, however, that the seed sets should not be too small. Large sets have a better chance than small ones of producing sturdy sprouts under unfavourable soil conditions. The best set is one of a blocky shape, ranging from 1½ to 2 ozs. in weight, and possessing at least one good eye. A 6-ounce Katahdin tuber, cut first lengthwise then crosswise will give four good sets. When cutting seed, it is unwise to remove the rose end, as the earliest sprouts arise from this portion of the potato.

Although most growers cut their seed by hand, it is considered that a more rapid method would be to fix the cutting knife rigidly to the end of a sloping table, on which the seed is emptied, and cut the tubers as desired by pulling the potato towards one. The cutting table has many advantages where large areas are to be planted in the shortest possible time.

Cultural Methods.

Early potatoes should not be planted too deeply, otherwise emergence is likely to be slow, and the risk of rotting increased. A depth of about 5 inches is sufficient for the earliest planted crops. The sets should be spaced about 15 inches apart in rows 2½ to 3 feet apart. A wide row spacing is desirable to enable cultivations and hillings to be given without disturbing roots and tubers.

Fertiliser is best applied in a band, about 2 to 3 inches to one side and slightly below the sets.

Although it is generally thought that potatoes do not need lime, being very tolerant of acid soils, overseas investigations indicate that calcium is more important in potato culture than was at first supposed. This should be of special interest to both tableland and coastal growers, who are not obtaining the yields they should, possibly because of excessively acid soils.

A New Variety.

I have previously mentioned that a new, introduced variety, Sebago, has given encouraging results in trials, and is likely to be grown on an extensive scale before long. Sebago is a late maturer, resistant to late blight, which produces uniformly large and well-shaped white tubers of good appearance. Seed of this variety is being increased as rapidly as possible.

Control of Eelworm Disease by the Use of Mustard Crops.

It is very disturbing to find eelworm spreading rapidly in our potato areas. To check this very serious soil-borne and easily spread disease, growers should practise a well-planned rotation. Although the use of pastures, and cereals to follow potatoes may assist in checking the pest, complete control is unlikely by this method.

As a result of overseas investigations, it has been found that mustard (*Brassica alba*) inhibits the development of the eelworm. It is thought that the best way in which this discovery can be exploited is to grow mustard thickly as a green manure crop in the spring or summer, for ploughing in later on. The presence of the mustard remains, and its plant oils are said to inhibit the hatching of the eelworms and in sufficient concentration is deadly to these pests. The Department proposes to investigate these claims.

Growers are advised to be ever on the alert for signs of eelworm, and on no account should eelworm-infested seed or seed suspected of carrying eelworm be planted. From the point of view of market value, eelworm-infested potatoes are worthless, under the grading regulations.

Premature Killing of Tops to be Tested.

In some countries it is the practice to kill potato tops with chemicals before maturity with the object of enabling the crop to be marketed earlier than otherwise would be possible, and also prevent losses during late blight epidemics. The premature killing of the tops may also be carried out to enable advantage to be taken of good weather for harvesting. The method may also have possibilities, under certain circumstances, for preventing the development of second growth in forward crops.

Although this technique is new to Australia, its possibilities are well worth investigating, and the Department proposes to do this as soon as possible.

Solving Crop and Pasture Problems—*continued from page* 285.

Commerce Act—is undertaken in the seed testing laboratory of the Division.

The New South Wales Agricultural Seeds Act is administered wholly by the Division. Under this Act all seeds sold in this State must conform to certain purity and germination standards. As far as possible an educational approach is made to seed vendors who are advised of suitable methods of storing and handling seeds.

Officers of the Division are available as chairmen under the Agricultural Holdings Act, and the Division serves in an advisory capacity to the Local Government Department in relation to weed control under the Local Government Act.

THE MAKING OF SILAGE.

A Succulent Conserved Fodder

Suitable for Drought Feeding.

(*Continued from page 186.*)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THE uses of silage and the theory of ensilage formed the subject of the first portion of this article, which appeared in the March issue. In the April instalment, the types of silos were discussed with reference to their comparative costs and efficiency and details were given of making silage in the tower, trench and pit types.

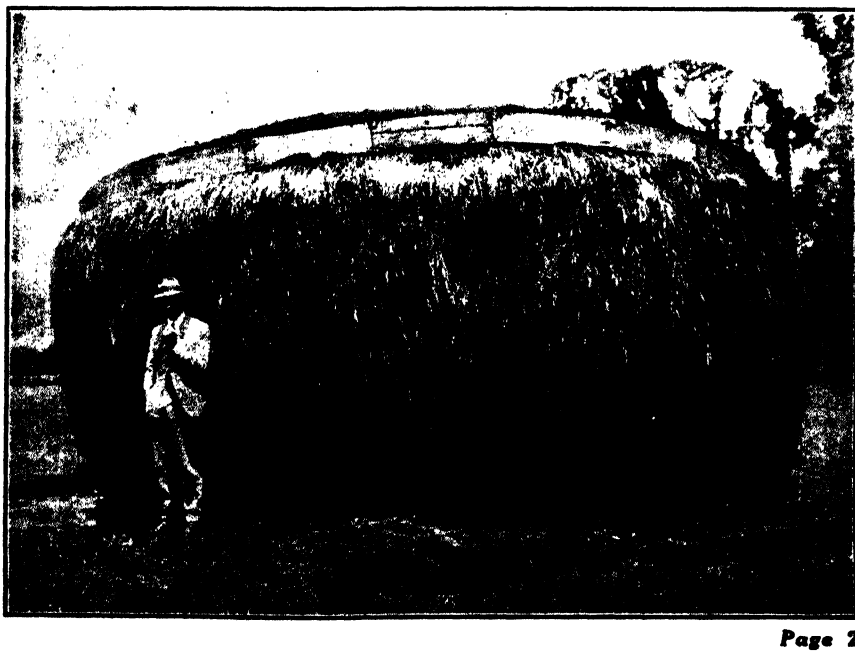
This third portion deals with the making of stack silage and silages made with chemical additions.

Stack Silage.

Stacking is a comparatively recent innovation in silage making which has come into use during the last half century. Its principal advantage is that it provides an opportunity to conserve, as silage, surplus pasture and other growth, after the permanent silo capacity has already been fully utilised, without the delay necessary to excavate a trench type of silo. In addition, the cost is lower—since there is no large outlay of capital.

When silage is made in stacks, however, there is more waste, because not only is a band of dry and partially mouldy material of variable depth produced on the exposed sides of the stack, but also the heat generated in curing is greater, with consequent loss of energy-supplying material. With tower, pit and trench silos, losses by respiration, etc., range up to 20 per cent., but with stacks they may be up to 30 per cent. or higher. Stack silage should preferably be used within six months of making.

Round stacks give excellent results, particularly with pasture, but stacks may be built on square or rectangular bases. It should be the aim to build the silage stack as tall as possible. The contents of the stack



A Well-built Grass Silage Stack.

This stack contains perennial rye, cocksfoot, paspalum and clovers. Note the boards for retaining the soil on top of the stack.

may be computed on the basis of 2 cubic yards of compacted silage (after settlement is complete) to the ton.

The site selected for the stack should be well drained and, for preference, slightly elevated, and conveniently located to the bails and crop to be cut. The crop is carted to the site and placed in position near the stack by means of sweep rakes, slides or waggons.

Building the Stack.

The building principle is the reverse of that employed for haystacks. That is, during the building the stack is made high at the sides and low in the centre, to allow even settling and thorough compaction at the edges, which assists in the exclusion of air.

Loose material may be forked on to the stack but if surplus sheaf material is stacked it should be placed in position. Alternate layers of sheaves are placed with all the heads of one layer pointing in the opposite direction to those of the previous layer, and with an overlap of about one-third of the length of a sheaf.

The material should be drawn up on different sides of the stack for each load; otherwise the stack is tramped down hard on one side only and the sides which are not walked on to any extent are left too loose. As stacking proceeds and the material has to be lifted to a greater height, a derrick and grab can be used with advantage for loading the crop on to the top of the stack.

During the building it is advantageous to hang a tarpaulin over the side of the stack exposed to the wind to prevent excessive drying of the material while still loose. When the work ceases for the night it is also an advantage to weight down the crop already in position, and this may be done effectively by passing a number of lengths of fencing wire over it, weighted at the ends with old fence posts or "butts" of soil.

Finishing the Stack.

When the top of the stack is reached a layer of grass may be added again, if desired, and then a foot of soil placed in position to provide weight and turn the rain. The stack is made a trifle high in the centre and the earth also heaped to assist in shedding rain, which must not be allowed to enter the stack. A thatching of dry grass or straw is also useful in achieving this object.

Framed Stacks.

Stacks can be built much truer and a better job is obtained if a framework is built enclosing the limits of the stack. Bush timber or saplings 4 to 6 inches in diameter at the base are used, buried to a depth of 2 feet and raised to a height of from 14 to 18 feet above ground level. This framework should be braced across the top at the ends and between at least two of the centre poles. Usually the uprights are spaced about 4 or 5 feet apart.

The framed stack is particularly useful, especially with sheaf material, because of the true even edge that can be built by its use.

When commencing to build, a layer of rough grass is spread to a depth of about 6 inches over the natural ground surface, and above this a layer of sheaves may be placed running the length of the stack and overlapping by one foot or more at each end. Continue to build in this way with sheaves to a height of 2 feet 6 inches, when the ends should be trimmed off to the finished size of the stack with a sharp cane knife or broad axe. When this is done a cross piece is placed at each end of the stack level with the top of the layer already in position, and further additions of material made overlapping at the ends to the same extent. The overlap which is supported by the cross piece is cut off in the same way.

With tall stacks built in this fashion an extremely satisfactory product can be obtained under our conditions, and the losses experienced, as a percentage of the total quantity of fodder cured, are very low, being confined to a band about 6 inches deep around the outside of the stack.

Opening the Stack.

The stack is opened in a similar way to the breaking of a hay stack, and each shelf should be removed to its full depth before a fresh one is opened. As small a surface as possible should be exposed to the air. A broad axe is a very useful implement for this operation.

Portable Silos.

A recent account of experimental work carried out at the Jealotts Hill Research Station, Berkshire, England, makes mention of a special portable silo which was said to be used successfully there. It consisted of a collapsible stave type wooden silo, held

together with steel bands, which could be dismantled when required. Long material was placed in these silos and thoroughly tramped. After about a week, when settling was well advanced, the silo was removed, leaving a very neat and compact stack with which very small losses through moulding were experienced. This type of silo, however, could not compete on economic grounds at present with the framed stack described above.

stage, and ensiled under good conditions. It would be reasonable to assume that the carbohydrate supply in these cases would be adequate to supply the needs of the preserving organisms.

Materials High in Protein or Very Succulent.

However, with materials which are young and actively growing, or high in protein content, the available supply of sugar is frequently so low that there is insufficient

A Two-horse Sweep or Push Rake.

to allow of rapid and complete fermentation in the silo. A high moisture content causes the acid produced to be diluted, and may bring about the same effect, while a crop which is too dry when cut is liable to suffer from the disadvantage of inadequate fermentable sugar supply.

It is not easy to produce a satisfactory silage from materials such as lucerne, which have a high protein content, nor from a crop such as rape, which is very watery in nature. Among the modifications of the normal practice which can be adopted in these cases, are the allowing of a period of wilting during which the moisture content is reduced—with a crop such as rape—and the use of the first and last cuts—in the case of lucerne.

The first and last cuts of leguminous crops such as lucerne or clover are made during bad hay making weather, under normal conditions. During the main growing period there is much to be said in favour of curing a lucerne crop as hay, rather than as silage. The first cut of lucerne in a season is

Silages made with Chemical Additions.

The curing of silage by the usual agencies is brought about as a result of the growth and life processes of micro-organisms. During their growth these bacteria are supplied with foodstuffs from material in the crop put into the silo. Some loss of foodstuff is inevitable, and there is always the possibility of undesirable changes causing unusually high losses and spoilage, as mentioned previously.

Slight losses of material occur in the carbohydrate (starch and sugar) portion of the crop, and considerable changes take place in nearly all the nutrient constituents. Although some very small losses are normally attendant on these latter changes, the products of the breakdown of protein, fat, and fibre are normally retained in the silage in a form which can be digested by stock; in fact, the digestibility of such constituents is frequently enhanced.

These processes would occur in a cereal crop such as maize or wheat, cut at the right

frequently quite weedy, and contains grass growth such as Barley grass, so that in effect it is a mixed silage which is made. Another precaution which could be taken is the mixing of a cereal crop with lucerne when ensiling, in order to add a natural supply of sugar.

There is still a danger of protein breakdown with these high protein or high moisture products, however, and the resulting silage may be over-wet, off flavoured and with a very vile odour—a product in which putrefactive changes have proceeded to an advanced stage.

With a view to preventing this type of protein breakdown, and with the further aim of producing a silage with a high protein content which will serve not only as a source of roughage for the stock eating it, but also as a valuable source of muscle building or milk producing material, various additions are made to the cut crop to bring about rapid acid production. When these additions are made, a good quality silage can be produced from high protein material which is low in starch and sugar content and would otherwise produce an unpalatable product, or alternatively if the starch and sugar content is already high, it will be preserved against destruction by the bacteria normally active in silage. Undesirable fermentations are also prevented from taking place.

The problem is tackled from two different aspects: either fermentable carbohydrate material, in the form of molasses or potatoes, is added to the cut crop, thus ensuring that the bacteria have ample supplies of foodstuff to work on, and thus can build up an acid concentration quickly; or else the acid is added directly to the crop in the form of lactic acid or mixtures of mineral acids, among those used being phosphoric, sulphuric, and hydrochloric (muriatic) acids.

Molassed Silage.

In making silage from any herbage which is at all dry or deficient in fermentable sugars for lactic acid production, it is useful to add sugar or molasses in solution to overcome this shortage and stimulate the desired fermentation. Young grassland herbage, lucerne, and similar high protein crops, and over-mature maize crops all benefit by the addition of a sugar solution. In fact, whenever the moisture content is deficient, it is far safer to add a sugar solution than plain water, as with water alone the risk of moulding is increased.

Molasses is usually added at the rate of from 1 to 2 lb. per 100 lb. of fresh material, *i.e.*, 22 to 45 lb. per ton. The amount may, however, be reduced to as low as 15 lb. per ton according to the nature of the crop handled. The molasses is diluted with one or more times its own volume of water and is spread over the cut crop as added to the silo in 6 or 8 inch layers. It is not essential that the rate of addition be carefully gauged for each layer, but an endeavour should be made to have all the greenstuff wetted with the solution. In practice the total capacity of the silo may be calculated and the total requirement of molasses determined. This may be then divided into equal portions and spread as filling proceeds. Owing to the tendency for the solution to leach downwards in the silo, rather more can be added in the uppermost layers.

Molasses is the Best Source of Sugar.

Whey is too dilute to serve as a source of sugar in place of molasses, but concentrated whey, sufficient to add about 1 lb. of milk sugar (dry matter) per 100 lb. of green crop can be used. Chopped up potatoes, artichokes, pollard, and other materials have been used also to add to the carbohydrate content of the silage, but generally speaking molasses is the cheapest, easiest to use, and very sure in its action. The results from molassed silages are equal, if not superior, to those obtained even with the very best acid cured silage.

Silage Made with Acid Additions.

The underlying principle in these processes is to induce rapidly a sufficiently high degree of acidity in the silage to control undesirable fermentations. The earlier experimenters tried adding lactic acid to silage, working on the principle that this is the acid produced in an ordinary silage. Very effective preservation can be obtained in this way, but lactic acid is expensive and not as accessible as some other acids which have since proved perfectly satisfactory for the purpose.

The A.I.V. Process.

Soon after World War I a Finn—A. I. Virtanen—working in association with a number of large dairy co-operatives in

Finland, developed the process which is now known by his initials as the A.I.V. process. It was found that a concentration of mineral acids effectively preserved silage in exactly the same manner as did additions of lactic acid or normal curing under ideal conditions.

Virtanen originally worked with a mixture of acids comprising variable proportions of sulphuric acid and hydrochloric acid (muriate acid or spirits of salts). Both are readily available at a lower price than lactic acid.

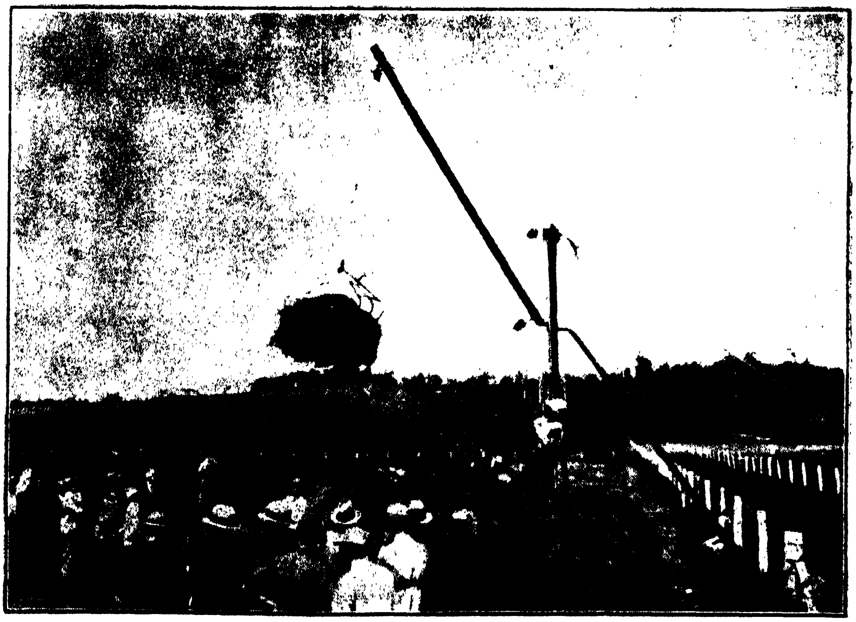
If either acid were used alone the quantity required would be approximately ⅝ lb. of commercial sulphuric acid to the gallon of water, or 2 lb. of commercial hydrochloric acid to the gallon of water. Any mixture in these proportions apparently has the desired effect; thus 1 lb. of hydrochloric acid plus ¼ lb. of sulphuric acid dissolved in a gallon of water should make a satisfactory product.

By the A.I.V. process excellent products can be produced, and the cost, in Finland,

The process was developed in Finland because of the prevalence of a nutritional disease in children. The disease, known as "night blindness," was proved to be associated with a lack of vitamin A in the diet, developed during the long winter months. The high acidity of A.I.V. silage causes a more or less complete preservation of the vitamin A and carotene content of the green crop. This vitamin is then secreted by the cows in their milk.

Virtanen also developed a special preparation called "mould death," which prevents fungus growth at the top of the silo. Chemically it is composed of a sulphur compound similar to mustard oil, and it was first developed after the observation that silage made from cabbages did not go mouldy, which was later proved due to the presence of this sulphur compound in their leaves. The use of the compound is apparently not very widespread under conditions similar to those found locally.

A Mast Stacker and Grab at Work.



is stated to be approximately the same as the cost of hay making for each pound of foodstuff produced. The A.I.V. process also allows very succulent crops such as kale or rape, cabbage, and root crops to be ensiled, and lucerne and clover-grass silages with a very high protein content to be preserved.

The process has some drawbacks, among these being the fact that the workers making the silage have to wear rubber boots as the acids rot through leather, and the additions of acid have to be made either with a wooden pail or a watering can lined with bakelite, varnish, rubber, or an acid-proof bitumen paint.

The process is little known to the Australian farmer at present, and he may be wary of using an unknown process necessitating the use of acids with which he is unfamiliar. For good results care and attention to detail will be necessary. The acids are neutralised after the silage is removed from the silo, and before feeding, by additions of lime, chalk, and washing soda; this is discussed later.

Experiments have shown that minerals which are deficient in the diet of stock in some areas may be added to the A.I.V. silage during manufacture, very successfully. Among these are phosphoric acid, cobalt and copper.

To sum up the advantages of the A.I.V. process one should bear in mind that under Australian conditions the supply of vitamin A to dairy stock is not nearly as great a concern as to the European farmer. Further, lucerne and legume hays can be made much more easily.

At present the molasses process might well receive more attention, particularly because of the cheapness of this material in comparison with acid additions. A product very little inferior to the best acid silages, and requiring no special treatment in its manufacture, can be made with molasses, and the process has much to recommend it under present conditions in this country.

Other Acid Additions.

Certain chemical compounds which, when added to water, break down to produce a mixture of phosphoric acid and hydrochloric acid, are also used in processes developed from the A.I.V. process. In addition the molasses and acid processes are sometimes combined, both being added at about half the concentration of each normally used. This latter process was originally developed in Denmark because of the fact that Virtanen had patented his process.

Amounts of Acids to Add.

To each 200 lb. of the several green forages suitable use the following quantities of acid solution of the strength recommended (see page 293).

Clover and other legumes 12 lb. (1¼ gallons).

Young actively growing grass, 10 lb. (1 gallon).

Clover-grass mixtures, 11 lb. (9 pints).

Kale and root crops, 8 lb. (6½ pints).

An extra 1 lb. (1 pint) of solution is used if the material is dry.

To 60 lb. of the preserved feed, 2 ounces of chalk or limestone and 1 ounce of sodium carbonate (washing soda) are added when feeding to neutralise the acid.

No rates of application are quoted for cereals, and it is reported that they are prone to go mouldy rapidly under this process, although rye is occasionally used.

Crops Which Need Chemical Additions.

The general rule to follow is that young materials such as actively growing pasture, and leguminous crops such as clover or lucerne, should be treated *always* with molasses for preference, or by the A.I.V. process. Mature materials such as lucerne which has gone dry and fibrous rather than sappy, and cereals such as maize, saccaline, wheat, etc., do not need molasses additions.

If the crop is dry and deficient in moisture so that the farmer thinks the addition of water would be advantageous to assist compaction and prevent excessive heat production, then it is recommended that molasses be used. The danger of moulding is thereby greatly decreased, and the cost of the addition of 15 to 20 lb. of molasses per ton of material is a very small outlay compared with the benefits derived.

(To be concluded.)

Top-Dressing of Subterranean Clover.

FOR the best results from Subterranean clover it should be top-dressed in the late autumn or early winter months with superphosphate at the rate of 1 cwt. per acre. This not only results in excellent leaf and stem growth, but also ensures the formation of an abundance of seed, which is essential in the case of any annual plant in order to retain it in a pasture.

Subterranean clover should be lightly stocked during its first year's growth, in order to enable the runners to become well grown and form plenty of seed. The intervening spaces between the plants are then quickly covered. If heavily stocked before the runners are well established, many plants will be pulled up and destroyed.—J. N. WHITTET, Chief Agrostologist.

SOYBEANS.

W. D. KERLE, H.D.A., Special Agronomist.

(*Concluded from page 231.*)

IN the first portion of this article, which appeared in May issue, the author described the manifold uses of the soybean plant and grain, the experience with the crop in this State, its soil and climatic requirements, and the few varieties which are available in this State.

The present instalment deals with the cultural and harvesting methods of the crop and the economic aspects of soybean growing.

After Cultivation.

The young seedlings cannot push through the ground if the surface is crusted with rain. It should be loosened with the harrows should this occur. It is also advisable to kill young weeds by harrowing before the seedlings appear, or it can be done after the plants are up across the rows in the heat of the day. Inter-row cultivations should be frequent enough to destroy weed growth when quite young. It is advisable not to throw a hill up to the beans as they bear the pods close to the ground; if the ground is kept level they can be cut with less loss when using mowers, etc., in harvesting.

Rotation.

Soybeans are a valuable crop in a rotation. The beneficial effect on crops which succeed soybeans in a rotation is often very marked. This response has been most noticeable with winter cereals, maize, sorghum and lucerne. Until they can be established as a commercial crop, however, and seed is available at a reasonable price, they cannot very well be fitted economically into a rotation system.

Harvesting.

Soybeans can be harvested for hay or ensilage from the time the pods are well formed until the leaves begin to turn yellow. The main value of the hay, however, lies in its protein content; hence the best time is when the pods are well filled out and at the first sign of the leaves yellowing. They are usually cut with the mower and allowed to wilt in the swath for a day or two, depending on weather conditions, raked and cocked. It will take a week to cure in good weather. Soybean hay is more difficult to make than cereal or lucerne hay, and loss of leaf is usual no matter how carefully it is

handled. A reaper and binder can be used, but sheaves must not be too big or too tightly tied and stooks must be small.

Cutting for silage is done about the same time as for hay. It should be used in conjunction with maize or sorghum to save loss of protein.

Harvesting soybeans for grain is done when the beans are in the hard dough stage. This stage is reached when the leaves turn yellow and fall, leaving the bare stems with their clusters of pods. It should not be delayed until the leaves have all fallen, but commenced when about three-fourths of the leaves have dropped and most of the pods have turned colour, but the stems still green and pliable. If the crop is left too long, the pods burst and shed their seed; this is accentuated when mechanical cutters come in contact with the hard woody over-ripe stems. Shattering is largely a matter of variety, and some judgment is necessary to harvest at the best time to prevent loss. When the crop is harvested as in the U.S.A., with combined harvester and thresher or special bean harvesters the seed must be fully mature to get the best results. Weather conditions are also important, as in hot, dry weather more shattering and cracking will occur. Harvesting may also be done with the reaper and binder, but considerable loss of grain occurs. A mowing machine with side delivery attachment to prevent travelling on the swath is also satisfactory for soybean harvesting. The plants must be "cocked" from the swath and left several days in the field to cure. The wheat header can be adapted for harvesting, but loss of grain occurs through inability to place the comb low enough to the ground.

The combined harvester and thresher is regarded in America as the best machine for harvesting soybeans from the standpoint of labour required, cost of operation and beans saved. Losses occur with these machines, chiefly at the cutter-bar, but also in threshing. Careful adjustment of cylinder speed, concave sieves and blast are necessary to avoid loss by cracking, loss over racks and sieves, etc. Some loss in harvesting soybeans appears inevitable; the average loss even with specially adapted machinery being at least 5 per cent.

Soybeans that have been harvested by other than combine harvesters have, of course, to be threshed. The ordinary grain thresher can be used, but it must be adjusted for beans. The chief adjustment to prevent cracking is to reduce the cylinder speed by at least one half of normal rate for wheat. The special pea and bean thresher used for Navy and French bean seed is satisfactory for soybeans. The maize husker and sheller also make a good thresher for soybeans, although not fast.

Small quantities can be threshed with the flail or spread out on hessian and rolled out, after which they are winnowed.

Soybeans "Cocked," after Harvesting with Reaper and Binder.

Storage.

Soybeans must be thoroughly dry when harvested otherwise they are liable to heat and mould. This is most likely to occur

if seed is bulked in large quantities in badly ventilated sheds. Storage is safe in bags or bins in well ventilated sheds if the moisture content is not more than 12 per cent. Weevils and rodents do not frequently cause damage of any consequence to soybeans in storage.

Yields.

Yields vary very considerably, depending on variety, season and cultural methods. In U.S.A. they vary from twenty to forty bushels per acre, but the average for the last ten years has been 16.4 bushels per acre. The highest average was 20.7 bushels per acre in 1939.

Although in test plots in this State, yields have been secured exceeding twenty bushels per acre, the average is nearer seven bushels per acre. In 1942-43, when soybeans were grown under contract to the Commonwealth Government, they averaged 1.2 bushels per acre on area sown. The season, however, was very dry, and some crops failed completely. The most successful grower in recent years is in the Armidale district, and he has averaged 10¼ bushels in the four seasons from 1941 to 1944. The area grown in this district in the 1945-46 season was thirty-four acres, and the yield just under seven bushels per acre.

Soybeans as Green Manure Crop between Tung Oil Trees.

Insect Pests and Diseases.

No serious attack by insect pests has occurred in this State. In America they have also been comparatively free of damage from this cause. Grasshoppers, beetles, army worms, corn ear worms, and various caterpillars have caused damage in some years, and may cause more damage here as the acreage increases.

Serious diseases have not been noted as yet in soybeans grown in this State. They are, however, subject to various fungous diseases which might occur when soybeans are more extensively grown. Diseases which cause damage in other parts of the world, at times to a serious extent, are bacterial blight, sclerotial blight, pod and stem blight, downy mildew, alternaria leaf spot, mosaic and root rots. In diseases where the causal agent is seed borne, effective control measures can be applied. Selection of varieties resistant to the more serious diseases is desirable.

Uses of Soybeans.

Apart from the uses of the soybean plant as a fodder, either as green feed, hay and silage or as a green manure, the uses of the grain are manifold. The amazing number of uses, which are increasing yearly, vary from food for humans and livestock to many industrial uses. In 1924 only about 6 per cent. of soybean production in the U.S.A. was crushed for oil, but in 1940 it rose to 83 per cent. As a result of wartime needs, particularly of oil for which the American Government established guaranteed prices, production of soybeans rose from 106,712,000 bushels in 1941 to 210,000,000 bushels the following year. Soybean oil, due to its comparatively high iodine number, is classed among the semi-drying oils, and used extensively for paints

and varnishes. It is used for soap making and candles and such varying products as glycerin, linoleum, celluloid, lecithin, printing ink, adhesives, rubber substitutes, cosmetics, etc. Refined soybean oil is used largely for edible purposes and in the manufacture of margarine and lard. In attempting to obtain a soybean oil having the drying properties of linseed oil, an inexpensive process for fractionating soybean oil into two parts has been developed recently. One of the parts is a relatively highly unsaturated oil with excellent drying properties, and the other is a relatively highly saturated oil with value as an edible oil.

The meal, after the oil is extracted, is an excellent stock feed. Soybeans as human food have many uses. Soybean flour is made use of in bread and other foods for diabetics. Breakfast foods, macaroni, bean curd, soy sauce and soy milk are other popular products of soybeans. The development of plastics from soybean meal has been extraordinarily successful. In the manufacture of plastics the oil must be thoroughly extracted from the meal by suitable solvents. It then contains from 44 to 48 per cent. crude protein. Soybean plastics are being used in the manufacture of car bodies, car parts and for many articles in commerce. The soybean is a valuable source of casein. One of the most recent and important productions of soybean protein is the making of a fibre resembling scoured wool. It has a warm soft feel, a natural crimp and a high degree of resiliency. Its tensile strength is about 80 per cent. compared with wool. It can be economically produced and can be handled on conventional cotton and worsted equipment.

Of recent years, suitable varieties of soybeans have been developed for use as a vegetable. The beans are pulled when fully developed in size, and the pods plunged into boiling water for two minutes to facilitate shelling. They are then cooked and used similarly to green peas. A number of these varieties have been tested in this State, and Easy Cook has given the best results.

The mature soybean is used extensively as a human food as a haricot bean, canned or as sprouts. Soybean milk, which can be satisfactorily made from the Haberlandt variety grown here, contains most of the same food elements as cow's milk, but in slightly smaller amounts. It can be used for practically all purposes for which cow's milk is used. The chief uses of soybean grain in this State at present is for use as human food, either as cooked matured beans for canning or flour for manufacture of diabetic foods. A market awaits economical production of oil for paints and varnishes and for manufacture of plastics and other industrial uses.

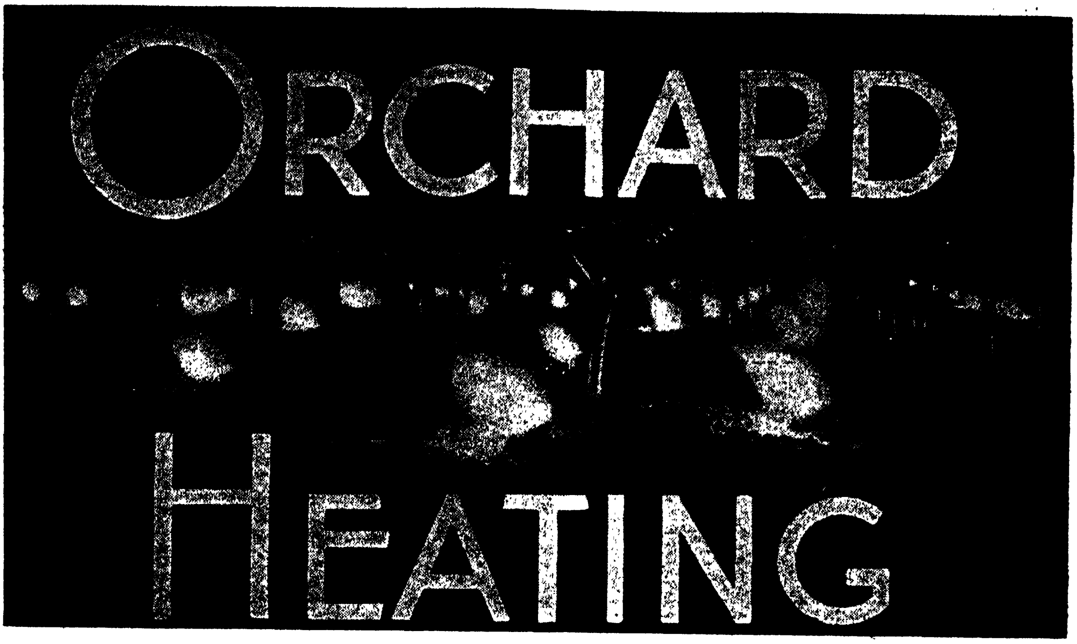
Economic Aspect of Soybean Growing.

Soybeans cannot be recommended as a commercial crop in this State on the basis of prospective yield and prewar import price. With the present limited experience of farmers in growing and handling the crop and with the varieties available a price of 25s. per bushel for prime quality beans would be necessary to make them comparable with other summer-growing crops. Apart from yield, soybeans are difficult to harvest without loss, even with modern harvesting and threshing machinery, and this adds considerably to the cost of production.

United States farmers have received the average equivalent Australian price of 5s. 10s. per bushel for soybeans in the last ten years, but the average yield has been 16½ bushels per acre.

For many years soybeans were grown in America primarily for hay, mostly where lucerne was not successful. In this State lucerne could be grown almost anywhere soybeans will grow, and has the added advantages of being perennial, easier to handle in hay making and can be grazed. In coastal areas, where green manuring is practised, especially in sugarcane districts, soybeans cannot be recommended in place of cowpeas. In the United States sowing soybeans in maize for hogging down or sheeping off is practised with very good results and should be of value in our coastal, tableland and south-western slopes maize areas.

If soybeans can be produced at a competitive price in Australia, there will be a big demand for the grain for many of the uses so popular in other countries of the world.



FRUIT GROWING.

To Prevent Frost Damage.

(*Continued from page* 258.)

J. R. DAVISON, Fruit Inspector.

LAST month the author described the natural phenomena which govern the incidence of frosts, the fundamentals of orchard heating and the influence of cultural practices adopted on the occurrence of frosts.

To Obtain Atmospheric Temperatures and Degree of Inversion.

To obtain atmospheric temperatures a scaffold, such as is represented in the accompanying sketch, is erected, and the temperatures at 25 feet and at between 2 feet 6 inches and 3 feet taken on a number of nights when frost occurs, before the danger period in September-October arrives. The scaffold should be erected within the block, and then no outside body such as large trees or farm buildings can affect the comparative readings taken.

In the morning following the frost, the thermometer at 25 feet is lowered and the minimum reading compared with that at the lower level. A height of 25 feet is used as the inversion level because it is thought that if there is not a good rise in temperature—7 or 8 degrees—at this height, the economy of heating becomes doubtful.

It has been proven that sixty burners to the acre, burning at the rate of approximately 1½ pints to the hour, can maintain a rise of 8 to 9 deg. when the temperature at 3 feet is 30-29 deg. Fahr., and under actual heating conditions it was not found necessary to light up more than 50 per cent. heaters during frosts when 29 deg. minimum was registered outside the heated area.

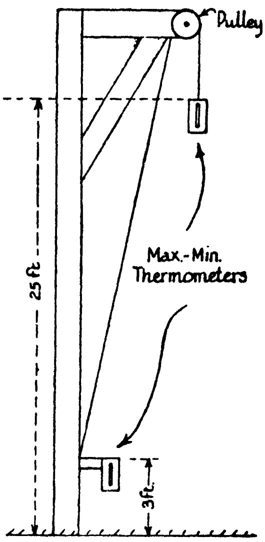
It can be taken as generally true, that the "inversion temperature" (air temperature at 25 feet) is higher in the spring than during the winter months. This naturally follows, spring days being warmer than winter days as a rule.

It was noted that on all nights of heating in the trials that a heavy bank of accumulated smoke hung between the levels 6 feet and about 18 feet from the ground, showing that air within the "blanket" was 33 deg. Fahr. at least, and the higher strata progressively warmer.

Temperature Variations.

Conditions which engender fluctuations of temperature during a frost or near frost are:—

1. Should a breeze spring up during the night, temperatures almost invariably rise and make heating unnecessary.



Sketch of Scaffold for Measuring Atmospheric Temperatures.

2. There is generally a drift of cold air, which is fairly constant in direction for a given district. In Yenda it varies little from year to year, coming in from just west of north to north-west. On only one occasion during recent years has it been known to swing farther than north-west. On this occasion it came in from practically due west and damaged orchards which had not previously been regarded as particularly frost-liable, and actually missed some of the farms which were usually affected. This drift depresses the temperature, and at Yenda it is apparently due to cold air rolling down from the range of low hills which border the district to the north.

3. Any body of passing cloud will hold the temperature at a safe level by impeding radiation.

4. A cold southerly wind blowing across the flat country of the Irrigation Area during the day chills the ground appreciably, and as a rule presages a frost for that night or possibly the night after.

Trials at Yenda.

Following the successful trial of heating 1 acre of sultana vines in 1936, Mrs. C. Hudson (Farm 1546, Yenda) secured equipment to safeguard all her vines, an area of 12 acres, and records were kept during the spring of 1937 of the results obtained; details were also secured of a trial of heating an area of 2 acres of apricots on the farm of Mr. T. McMahon (Farm No. 1568).

Types of Heater Used.

Four types of heaters were used at Yenda during the 1937 spring frosts. They were:

(1) Lard pail type, 5-quart size, with triangular spreader.

(2) Lard pail type, 8-quart size, with two triangular spreaders.

The 8-quart size, as used the previous year with one triangular spreader gave off more heat than was required, and to obviate this a larger spreader was designed. Under field conditions this spreader on the 8-quart heater gave off a comparable amount of heat to the 5-quart heater. However, when about 60 per cent. of the fuel had been burned, the flames were choked, and either flickered ineffectively or went out; it was thus necessary to watch these heaters and to go around and substitute the smaller spreader for the large one. This use of two spreaders was found impracticable.

The drawback to these heaters is that the variation of output of heat is limited to two rates—with spreader on or with spreader off.

(3) The square type, of 6-quarts capacity. These heaters show the greatest promise, and in the opinion of those growers who are familiar with the above types are definitely the easiest to manage. At no time during the heating were these more than 3 inches open (8½ x 8½ inches is the size of the top of the heater), but the sliding lid makes the putting out or varying of the flame a safe and speedy operation.

(4) English heaters.—The large capacity (3½ gallons) of these is outweighed by the initial cost and the limited range of heat

MODERN TECHNIQUE IN THE CONTROL OF FRUIT PESTS

SHELL

Eggs—
and how to break them

There is one type of egg that is a particular headache to orchardists—the eggs of the Green Peach Aphis and the Black Cherry Aphis. There is a knack in breaking up and destroying an infestation of Aphid eggs—the knack lies in perfect timing of the spraying period. The Aphides breed in the weeds and rubbish during the autumn and the eggs are laid on the trees in winter. A powerful spray is the only type that will destroy the eggs—a spray which is not safe to apply when the buds are open. A mild winter or late autumn rains may delay the egg laying so careful timing of spray is essential, and the spraying oil must be effective for if the destruction fails it may be too late to try again.

You can be sure of effective destruction by always using Shell Universal Winterspray.

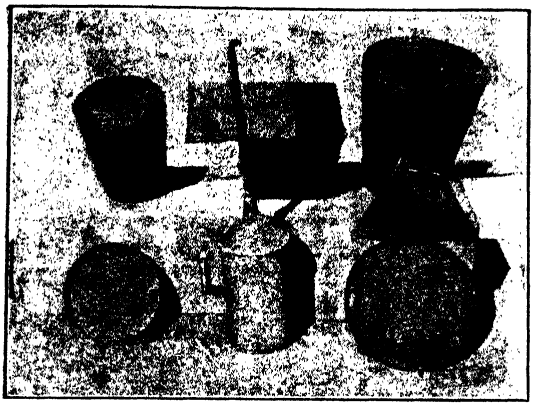
SHELL

SPRAYING RECOMMENDATION

SHELL SPRAYING OILS FOR ALL FRUITS AND ALL SEASONS

THE SHELL COMPANY OF AUSTRALIA LIMITED (Incorporated in Great Britain)

output. No effect short of smothering the flame was noticed on the consumption of fuel (and consequently heat output) by using the lid as a spreader or damper.



Orchard Heating Apparatus.
Left.—5-quart lard pail heater. *Centre.*—Square type heater with sliding lid. *Right.*—8-quart lard pail heater. *Front centre.*—Lighting torch.

This type came to hand for test after the full complement of burners had been set out on Mrs. Hudson's farm (No. 1546), but sixty were used to heat 1 acre of apricots on the farm of Mr. T. McMahon (No. 1568).

Comparative burning periods were found on test to be as follows:—

6-quart (square).	5-quart (one spreader).	8-quart (two spreaders).
*2-inch opening— 7 hrs. 5 mins. 3-inch opening— 7 hrs. 15 mins. 4-inch opening— 5 hrs. 35 mins. 5-inch opening— 3 hrs. 40 mins.	Spreader was removed at 4½ hours, otherwise flame would have smothered. Burned in total 5½ hours.	Same burning rate as 5-quart while large spreader was used until about 40 per cent. fuel remained, when smaller spreader had to be substituted.

* The size of the opening refers to the space left when the sliding lid is pulled out. The 2-inch opening did not prove satisfactory, as the heat evolved was not sufficient to raise the temperature effectively.

Thermometers.

The minimum clear alcohol thermometers were placed as checks outside the heated areas up drift from the orchard—one to each block of vines.

Four similar thermometers were used inside the heated areas to indicate the effect of the heaters.

The thermometers, hung on hooded wooden stands, were placed at the same level from the ground as the top wire of the trellis, and as far as possible from any fires, so as to give a true minimum reading within the vine area.

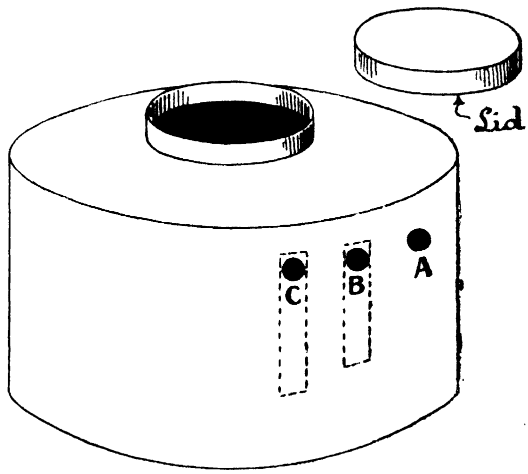
An alarm thermometer (34 deg. Fahr.) was set in the coldest part of the orchard and wired to an electric alarm bell, energised by three 1.1-volt telephone type dry cells, insulated positive and plain negative wire (ordinary tie wire) being used.

Accurate Thermometers Essential.

It is necessary to check the accuracy of the alarm thermometer and to determine any adjustment necessary some time before the period of danger from frost arrives.

The alarm thermometer used in the tests, when checked against an accurate minimum thermometer, was found to be dangerously inaccurate, registering 34 deg. Fahr., when the actual temperature at the 3-ft. level was 32.5. Experiment showed that by removing the wooden hood and lowering the alarm thermometer to 2 ft. 9 in. the alarm rang when the temperature at 3 ft. was 34 deg., and so gave the required warning in time for lighting-up to be started.

It would appear that the main reason for this inaccuracy lies in storing the thermometer on the flat during the period of



Sketch of English Type 3½-gallon Capacity Heater.
Note that the orifices A, B and C are sleeved inside so that an air current is always available at the fuel level.

disuse, when continuous expansion and contraction at high temperatures forces some of the alcohol through the mercury from one leg to the other. This movement seems

to be invariably from right to left and it, therefore, follows that the temperature registered will be higher than the actual. It is possible, by patient juggling to transfer sufficient alcohol back, to make the thermometer read correctly.

The accuracy of minimum thermometers is very variable, and they should be checked against one of known accuracy in the range of temperatures at which they are to function as guides during a frost, *i.e.*, 28-34 deg. Fahr. Many thermometers will give true readings at day temperatures, but will be degrees out in the range mentioned. This inaccuracy can be due to the marking being on the backing instead of the actual glass of the thermometer, and the glass being inadvertently moved one way or the other.

There is also the inaccuracy which is caused by unevenness in the bore of the tube. As the mercury or alcohol expands or contracts, it is forced along inside the tube. If the tube were absolutely even, any degree would give exactly the same rise or fall as measured on the instrument. Where there are differences in the bore (and there usually are) a narrowing will give a greater movement, and where the bore is wider, the movement of the fluid will be less. Such thermometers should be checked, and the error marked on the backing so that allowance can be made when readings are taken.

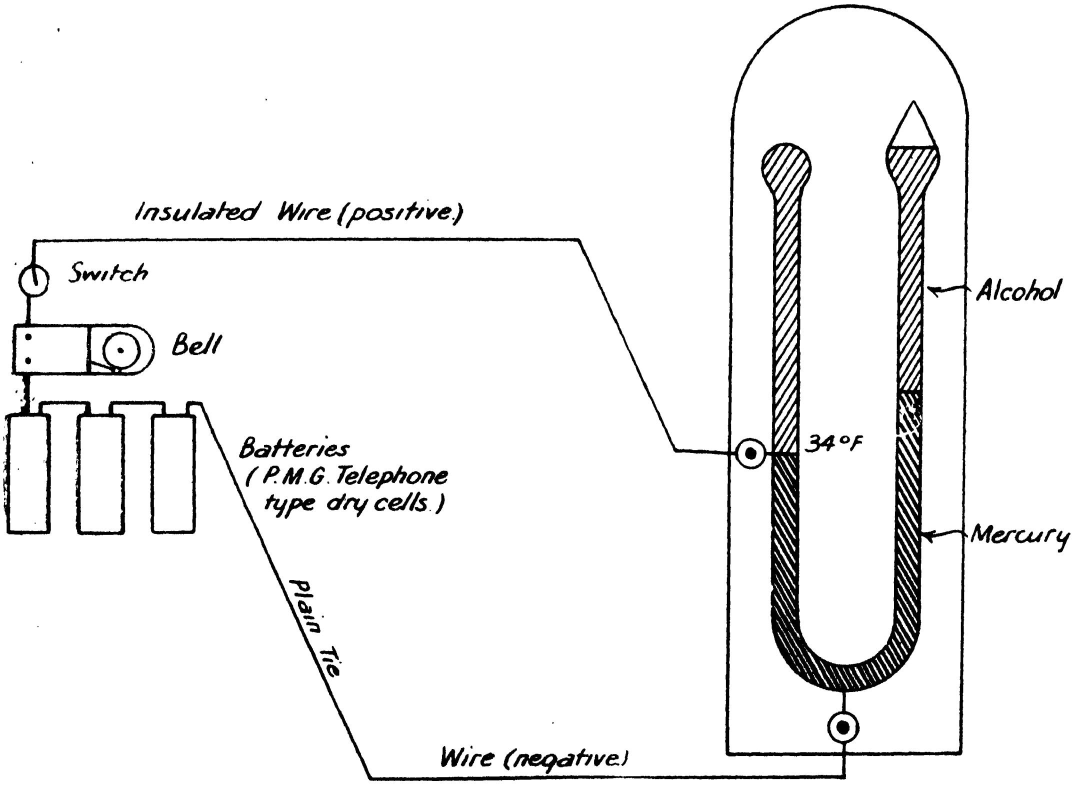


Diagram of Alarm Thermometer-Alarm Bell Circuit.

When the mercury touches the platinum wire at 34 deg. Fahr. the circuit is completed (when the switch is shut, of course; it is shown open in the diagram), and the bell rings.

A car battery makes a very powerful source of energy to activate the bell, but complete outfits, switch, bell and cells in neat boxes can be obtained.

(*To be concluded.*)

THE COMMON STORAGE OF GRANNY SMITH APPLES

In Relation to Scald and Cold Storage.

E. C. WHITTAKER, Fruit Officer.

THE importance of the Granny Smith crop to New South Wales growers is such that a special effort is warranted to ensure that this apple reaches the consumer in prime condition. Late in the year during the November-December period, which is usually a period of high prices, a proportion of the cool-stored Granny Smiths always reaches the market in far from prime condition, and much of the trouble can be traced back to over-maturity at the time of storing, usually caused by too long a period of common storage.

An excessive period of common storage is liable to cause considerable trouble, as it may seriously curtail the cool storage life, and in addition result in too much yellow colour in the apples for present trade requirements, whilst the danger of serious losses from such physiological disorders as lenticel spot, late scald, etc., is increased considerably.

Prolonged common storage of Granny Smith apples has, in the past, usually occurred because at the time they should have been cool stored, the stores were filled with other varieties, and adequate space was not available, or because time and staff have not been adequate to prepare these other varieties for market and at the same time wrap and pack the Granny Smiths for cool storage.

It has been the general practice to hold Granny Smith apples in common storage for periods varying from a week or two to as much as six weeks or longer, prior to cool storing. By itself, this common storage period is of very limited value in scald control—unless carried to extremes, when such assets as colour and ultimate storage life are sacrificed. No method of handling will take the place of the use of oiled wraps so far as scald control is concerned.

In some instances then we have been so much obsessed with the control of superficial scald in this apple that we may have sacrificed some of its other good qualities.

However, it has been demonstrated over the years that a common storage period of up to two weeks in the case of highland-grown fruit does no harm, provided the fruit is harvested at the correct stage, and, on the other hand, has definite advantages. For instance, it is a very convenient period insofar as it allows of the crop being harvested without interruption and, in addition, allows a period during which pears and short storage apples can be packed out of the cold store to make room for Granny Smiths. Furthermore, a short period of common storage such as this, is of value because it allows any troubles such as codling moth infestation, stem punctures, bruises, etc., to become more apparent and easily detected when packing, thus saving a good deal of extra labour and trouble in re-packing later on.

It is felt that the time has arrived when we should examine our methods of handling with a view to general improvement of quality, especially in the case of highland-grown fruit which composes the bulk of the long storage stuff.

The fact is perhaps not widely enough appreciated that Granny Smiths can be held for a limited period in cool store unwrapped without developing scald, provided they are not immature when harvested. In Departmental experiments carried out during the past few years at Orange and Batlow, it has been proved that the Granny Smith can be held at ordinary cool storage temperature, either unwrapped or plain wrapped, until early July without any development of superficial scald. The trials also showed that fruit could be held until early August with practically no expectation of scald development. Fruit so treated removed from store in August, wrapped in oiled wraps and returned to store until December, showed only very light superficial scald

(*Continued on page* 312.)

Rice Research Work on the Murrumbidgee Irrigation Area.

Activities to be Resumed.

ANNOUNCING that his Department was now in a position to resume some of the investigational, breeding and pure seed production work with rice, which had been in abeyance during the war years, Hon. E. H. Graham, M.L.A., Minister for Agriculture, recently reviewed the work that had been accomplished and indicated the activities which it was proposed to undertake in the near future.

Reviewing the contribution which his Department had made to the establishment and progress of the rice industry, Mr. Graham said that since 1923, when experimental plantings in co-operation with the Water Conservation and Irrigation Commission had demonstrated rice to be a successful commercial proposition, much intensive research work had been conducted by Departmental officers.

Firstly, in co-operation with growers and later at the specially established Rice Research Station (now Leeton Experiment Farm) the best cultural practices had been determined, including land preparation, times and rates of sowing, fertilizers, weed control and watering methods, and harvesting. Well over 1,000 varieties of rice had been introduced from many parts of the world, many thousands of selections had been tested, and breeding to produce better types was well advanced. Superior pure strains had been selected from the Californian varieties on which the industry was founded, and red rice eliminated from them. A pure-seed production programme was organised, with the help of the Rice Marketing Board, to ensure regular supplies of this seed to all growers.

Unfortunately, in 1942, all rice work had to be suspended because of a pressing necessity for the production of vegetable seed. Supplies previously imported were suddenly cut off by the Pacific war, and the Departmental staff was also seriously depleted by enlistment and transfer.

Although all rice experimental work was necessarily discontinued, the collection of rice varieties, many crossbreds, and the basic pure seed stocks were resown periodically to maintain their germinating power. With the return to duty of a plant breeder specialising in rice, and the appointment of an experimentalist last year, all this material was resown during the past season, and some of the more important experiments were resumed at the Riverina Welfare Farm, which was still under the control of the Department of Agriculture.

At a conference held last year between the rice millers and the Rice Marketing Board, a Departmental representative outlined the programme of rice experimental and pure-seed work then being resumed. The conference voted a sum of £1,000, as a gift from the rice industry, to help the Department in re-establishing the rice work. This donation was to be used in building a Rice Laboratory to house the rice sample milling and other equipment, valued at over £300, previously supplied by the Rice Marketing Board.

Amongst the most important rice projects which were now again in progress were pure-seed production and investigations of various watering methods designed to reduce the amount of water used in growing rice crops. The pure seed stocks were unfortunately so small that two seasons would elapse before bulk supplies were again available.

Another important investigation interrupted by the war involved the comparison of various typical crop rotation systems including rice. This set of long-term experiments was being redesigned to include recent agricultural developments on the Murrumbidgee Irrigation Area. It was intended to invite the assistance of all sections of the rice industry, and particularly growers, in ensuring that these rotations, and other experiments to be laid down, were as comprehensive and informative as it was possible to make them.

Some problems were bound to occur, in connection with rice, which could not be tackled at the Departmental Farms, through lack of certain soil types or other factors. Such problems would be dealt with where they occurred, in co-operative efforts with growers, or through extension plots where necessary.

INSECT PESTS

Notes contributed by the Entomological branch

The Bag-Shelter Moth (*Ochrogaster contraria*).

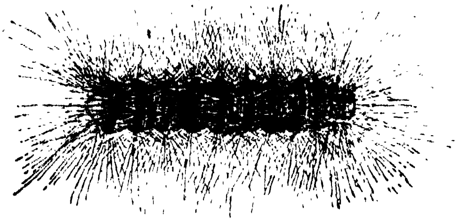
DURING the autumn months requests are received for measures to control the caterpillars of this moth, which attack, and at times completely defoliate, groups of weeping myall or boree trees (Acacia pendula), growing in western and south-western districts of this State, where these trees are used for ornamental or shade purposes around homesteads, or for fodder in times of drought.

The moths, which appear in November, lay their eggs in masses on the twigs or upon the leaves, usually matted together and covered with a mass of down from their abdomens. The whole egg-mass is a hairy, yellowish ball about ¾ inch in diameter. The eggs are laid about December, and each egg-mass may contain upwards of 200 shining, light brown eggs.

The larvae hatch out early in January, and at first these small caterpillars use their felted egg-mass as a shelter for some weeks, but as soon as they move about, select a fork amongst the branches where they commence to spin a stout silken web, of a dull yellowish-brown colour and of a consistency of stout brown paper, matting together the surrounding twigs and leaves with silken strands. As they grow they increase the size of their bag-shelter until it may be 10 inches or more in length. The bag-shelter, which is closed at the bottom, swells out into an irregular rounded mass, and is open at the tip.

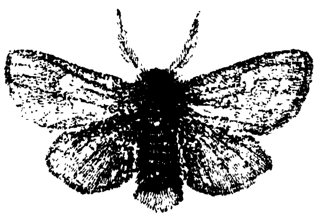
During the day the caterpillars remain in these shelters, but at night crawl out, one after another, up to the foliage of the tree. There they feed until daylight, and then crawl back to the shelter until the following night. On account of their habit of wandering about one after another in a long continuous "chain," they are sometimes referred to as "processionary caterpillars." They spin fine silken strands as

Myall Trees, showing Bag-shelters and Defoliation caused by the Caterpillars of the Bag-shelter Moth.



The Bag-shelter Caterpillar.

Female of the Bag-shelter Moth.



Male of the Bag-shelter Moth.

they travel along, and these are visible as a thin line after the caterpillars have passed.

The caterpillars, which measure up to 2 inches in length when fully-fed, are stout thick-bodied insects. They are of a general greyish-brown colour, and are so covered with reddish-brown hairs that they appear to be a uniform reddish-brown.

When fully-fed, the caterpillars crawl down the trunk of the tree, which by this time may be almost leafless, and bury themselves in the earth, where they spin light flimsy cocoons in which are incorporated the hairs from the caterpillars' bodies and particles of earth.

The hairs from the caterpillars' bodies may cause severe irritation to the skins of some persons. Where they fall upon the hands and arms, the hairs may enter the skin, and have been known to cause very painful and serious rashes, necessitating medical treatment. Mortality has occurred among sheep where trees bearing these bag-shelters have been lopped and fed to the animals.

The bag-shelters, long after the caterpillars have left them, contain masses of these stinging hairs, amongst the cast skins and debris, and may still cause extreme irritation to anyone handling them.

The moths vary in size, and the larger females, which may measure up to about 2½ inches across their outspread wings, are very broad in proportion. The general body colour is dark greyish-brown with a small white spot near the middle of each forewing and a smaller more indistinct one on each hindwing. The head and thorax are thickly covered with long brown hairs, which are yellow and lance-shaped at their tips. The abdomen of the male is barred with black and yellow rings, but that of the female is much larger, cylindrical, and light yellowish-brown at the rounded extremity.

There is only one generation a year.

Control.

The caterpillars are attacked by a number of natural enemies and these include chalcid wasps and tachinid flies, and the eggs are preyed upon by the caterpillars of a moth.

Bag-shelter caterpillars may be killed by spraying the foliage with arsenate of lead, using 1½ lb. of arsenate of lead powder to 40 gallons of water. The disadvantages of this method are, firstly, that it is usually not economical to spray, and, secondly, that the foliage is rendered poisonous to stock for a number of weeks, or perhaps months, after spraying.

It is possible that a D.D.T. spray, at a concentration of 0.1 per cent. D.D.T., would also effectively control the caterpillars, but while D.D.T. is not regarded as such a dangerous poison as arsenic, it is nevertheless poisonous to man and the lower animals, and is regarded as an extremely cumulative poison.

The best method of control appears to be the destruction of the colonies while in their younger stages, early in the year. Considerable defoliation can be prevented if the bag-shelters are cut off while they are about the size of hens' eggs, and also, by destroying the young colonies, trouble from the stinging hairs is avoided. At this time,

after cutting off, the caterpillars may be destroyed by trampling them on the ground, or by taking them well away from the trees.

The work is not easy, but as most of the egg-masses are deposited on twigs fairly close to the ground, a man standing in a dray can remove the majority, by means of secateurs, in a few minutes. For masses higher in the trees, however, long cutters, such as are used in trimming street trees, would be required.

Care should be exercised in handling the bag-shelters, and if the foliage of the trees is used for fodder, animals should not be allowed access to any infested branches.

Egg-masses of the Bag-shelter Moth

The Bag-shelter, which consists of Leaves and Twigs Woven Together with Silken Strands.

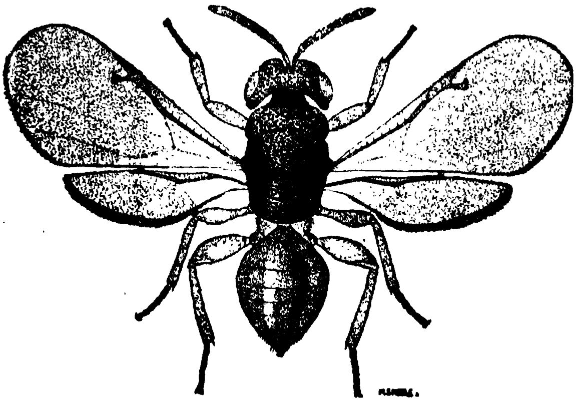
The Citrus Gall Wasp (*Eurytoma fellis*).

THIS small native species of wasp develops in various kinds of wild citrus, but also commonly infests citrus orchards on the North Coast of this State. Although it attacks all varieties of citrus, lemon and grapefruit trees are most frequently injured.

The damage is caused by the female wasp depositing eggs within the stems, the laying of the eggs and subsequent development of the wasp larvae resulting in the formation of extensive galls on the trees. Although the stems are usually attacked, the midribs, petioles and fruit stems are also subject to infestation. When nursery stocks are infested the main stems may be attacked, the injury then being particularly serious.

The adults, which measure about one-tenth inch in length, are small black wasps. They emerge from the galls in the spring mainly during the month of October. The

life of the adult is short, being of only about one week's duration. They lay their eggs, however, almost immediately after



Adult Citrus Gall Wasp.

emergence from the gall, and select for this purpose, young growth only a few weeks old which at that period occurs abundantly on the trees.

Most of the eggs are laid during the first twenty-four hours following the wasp's emergence from the gall. The eggs are deposited between the bark and the wood, but evidence of gall development does not appear until several months after the larvae have hatched.

The legless larvae develop and feed within the plant tissues throughout the summer, autumn and winter, and the galls continue to increase in size until the early winter. The larval period occupies nine or ten months, and the pupal or chrysalis stage, which is passed within the gall, occupies about one month.

Control.

The systematic cutting off and destruction of the galls is recommended as a means of controlling this pest.

As the life-cycle is an annual one, and the galls take some months to develop, it is advisable to wait until the autumn or winter before removing them, but all should be removed by the end of August. The galls should then be burnt, as adult wasps will emerge from the galls, even though the latter have been removed from the trees for several months.

The removal and destruction of the galls during winter should ensure relative freedom from infestation for several years, as the wasps are not strong fliers, and appear to prefer to lay their eggs in the trees in which they themselves developed.

Galls formed by the Citrus Gall Wasp on a Common Lemon.

Predaceous Shield Bugs (*Pentatomidae*).

ALTHOUGH the majority of the members of the bug family, known popularly as "shield bugs," feed on the sap of various plants, there are several species which attack living insects. They insert their beaks into the bodies of their victims and extract their body fluids.

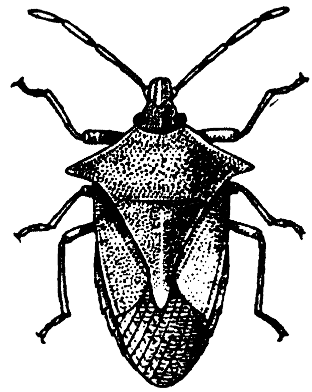
The "shield bug" family, in Australia, contains nearly four hundred species, and includes such well-known pests as the green vegetable bug (*Nezara viridula*), the spiny lemon bug (*Biprorulus bibax*) and the bronze orange bug (*Rhoecocoris sulciventris*).

Two species of the beneficial forms that occur commonly in this State are *Oechalia consocialis,* often known as the "vine-moth bug," and *Cermatulus nasalis.* As the insects attacked are frequently the caterpillars and grubs of pest insects, these predaceous bugs are sometimes of considerable value.

The vine-moth bug is somewhat variable in size, the largest adults measuring up to ½ inch in length. It is light reddish-brown in colour, mottled with yellow. The sides of the thorax are spined, and the abdomen tapers somewhat to its tip.

In vineyards heavily infested with the vine moth (*Phalaenoides glycine*), all stages of this bug are sometimes to be seen in large numbers running about the vines, frequently with the caterpillars impaled upon their beaks. This bug also feeds on other injurious caterpillars, including species of *Papilio* (a butterfly) and *Tortrix* (a (moth).

The second species, *C. nasalis,* which measures about ½-inch in length, varies from olive-brown to almost black. Both the adults and immature forms of this bug feed upon and destroy the larvae of the cherry slug (*Caliroa limacina*), vine moth caterpillars and the grubs of the fig-leaf beetle (*Galerucа semipullata*).



The Predaceous Vine Moth Bug.

War Service Honours for Departmental Entomologists.

Malarial and Scrub Typhus Control.

THE achievements of Australian workers in various branches of science contributed inestimably to Allied success in the war, and a recent report of the Entomological Branch of the New South Wales Department of Agriculture contains interesting evidence of the fact.

"It is pleasing to record that two officers of the Entomological Branch received special honours in connection with their association with Entomological Units in operational areas during the war," writes Mr. T. McCarthy, Chief Entomologist.

"Major S. L. Allman was mentioned in Despatches for his work in malarial control at Milne Bay, New Guinea, in 1942. This work was carried out prior to the use of atebrin, and malarial casualties were reduced from 1 in 10 per week to 1 in 1,000 per week.

"Major R. N. McCulloch has received the M.B.E. for his work on scrub typhus mite in New Guinea and Borneo. His work formed the basis of control measures subsequently adopted by all the Allied Forces in the South-West Pacific. Casualties from scrub typhus were reduced by 90 per cent.

"In a report by the Field Director, Medical Research Council, South East Asia Command, it was stated that 'the use of repellents ably pioneered by Australian entomologists comprises one of the most effective achievements of the medical backroom in the present war.'"

Farmers will associate themselves cordially with this tribute to a branch of science without the benefits of which their task would be impossible.

Major Allman is Senior Entomologist of the Department. Major McCulloch recently resigned from his position of Entomologist in order to take up the appointment of Deputy Principal of Roseworthy Agricultural College, South Australia.

Liming for Grassland Improvement.

IN pasture improvement lime cannot take the place of superphosphate, but as ground carbonate of lime or some other finely ground form, it is a valuable supplement to that fertiliser. Numerous instances have occurred in coastal areas where applications of lime in addition to superphosphate as compared with superphosphate alone, have increased the carrying capacity of improved pastures by 100 per cent.

Lime not only promotes better pasture growth, increases the vigour of clovers, improves soil texture, and encourages the functions of useful bacteria; it also checks surface soil acidity, supplies free calcium to the plant, and builds up animal bone.

The usual rate of application on grassland is 10 cwt. of ground carbonate of lime per acre. It should be applied during the autumn or early winter, this period coinciding with the renovation and top-dressing with superphosphate of coastal pastures.

The Use of—

WINE WITH MEALS.

Suggestions for Choosing and Serving.

H. L. MANUEL, Viticultural Expert.

TO appreciate wine, particularly light beverage or table wine, it should be taken with meals. It is said by some that wine "makes" the meal, and that, in entertaining, it is somewhat a waste of money to prepare and serve an extravagant meal without including wine.

Types of Light Beverage Wines.

These table wines are known as "light dry" and are not "sour" as some folk are inclined to describe them. Such wines are known in the trade as hock, chablis, claret and burgundy. Sauterne is also a light wine, but possesses a little sweetness which tends to make it more popular, particularly with the ladies. However, the wine connoisseur and those folk educated to wine drinking prefer the straight dry wines. The hock and the chablis are white wines and the claret and burgundy red wines.

The hock possesses a little more acidity than the chablis, leaving the palate after the drinking of this wine with a fresh acid finish. The chablis, on the other hand, leaves a soft roughness with a slight suggestion of fruitiness.

Our Australian clarets are lighter than what is known as Australian burgundies and, in my opinion, a good claret is the finest wine of all.

These light table wines may be described as natural wines; the only alcohol they contain comes from the naturally produced spirit—by the action of the yeast (which is found on the grapes) upon the grape sugar, which converts the sugar into alcohol in the course of fermentation.

In the case of dry sherry, sweet white wine, ports and muscats, grape spirit is added. In the sweet wines it is added to the must to check fermentation and preserve a sweetness in the wines. This grape spirit is produced by the distillation of wine, and the adding of this spirit to the wine is known as fortifying.

Appearance Is Important When Serving.

In the use of wine one should endeavour to show the wine to its best advantage, and to do this, not only serve it in the right type of glass as regards size, but in a glass through which the light can filter to show the colour and clearness of the wine. A plain, thin, crystal clear glass is the best for the purpose.

The appearance of a good wine is very pleasing to the senses and adds to the enjoyment of partaking of wine. The bouquet or nose also affects the senses, and in many wines conveys to the palate what is expected in the tasting of the particular wine.

Sherry and port glasses are smaller in size than those used for hock, claret and burgundy.

Wines Suited to Courses.

When serving wines with a meal, sherry can be taken beforehand as an appetiser (sherry is a dry wine and not sweet as some folks are lead to believe), or again it can be served along with the soup. A fruity sherry is not out of place if this be preferred.

If hors d'oevres are on the menu, sherry can be served dry and cool (never iced).

With oysters serve a light wine such as hock or chablis—cold, not iced.

With soup, serve sherry, and with fish serve hock or chablis and perhaps sauterne.

With red meat, serve claret or burgundy at about room temperature—not cold.

With white fleshed poultry such as fowl, a sparkling white wine can be served, but with duck and goose I prefer a sparkling

(*Continued on page* 320)

The Use of—

FRUITS AND VEGETABLES IN THE HOME.

JUNE CHANCELLOR, Dip. Home Ec., Fruit Preserving Instructress.

FRUIT JELLIES AND BUTTERS.

EVEN the most accomplished housewife experiences a glow of pride and satisfaction when she successfully turns out a fresh supply of sparkling jelly. Fruit butters also are popular, and, like jelly, are delicious when served with freshly baked scones, pikelets, toast or bread. Remember, too, that a jar of jelly or fruit butter, wrapped attractively in cellophane paper, makes a most pleasing and suitable gift for many occasions.

Jellies.

A good jelly is clear, sparkling and fruit flavoured. In consistency it should be sufficiently firm to hold its shape when turned from a glass, but soft enough to spread easily.

To make a natural jelly fruit juice must contain acid and pectin. The amount and quality of pectin in fruit varies at different stages of maturity; fruit for jelly making should be barely ripe.

Fruits which contain sufficient acid and pectin for a good jelly include tart apples, currants, plums, quinces, guavas, blackberries, loganberries and most citrus fruits. The juice of fruit low in pectin may be combined with any of the above fruits, but apple juice is considered best in combination, as it affects the colour and flavour least.

Fruit juices lacking acid are improved by the addition of lemon juice.

Pectin Test.

The following is a simple method of testing the extracted fruit juice if there is any doubt as to its suitability for jelly making:—

Place 1 dessertspoon of the cooled juice in a glass and add 2 dessertspoons of methylated spirits, shake gently, then allow to stand 1 minute. If a large amount of pectin is present, a firm, jelly-like clot will form; if the clot is broken into several pieces a normal amount of pectin is indicated, and a poor, badly broken clot proves that the pectin is insufficient.

Quantity of Sugar.

Generally two-thirds to 1 cup of sugar is added to each cup of juice, the fruit juices low in pectin requiring less sugar. Too much sugar produces a weak, syrupy jelly, and too little causes toughness.

Method of Making Jelly.

(*a*) *Extracting the Juice*:—

1. Wash fruit and cut up, if large.

2. Place in a pan with just sufficient water to cover. Juicy fruits may be crushed so that the juice will flow freely, and in such cases little or no water will be required.

3. Boil gently with the lid on the pan until the fruit is quite tender.

4. Strain carefully through a jelly bag or two or three thicknesses of cheesecloth. Another method of straining is first through a colander to remove the bulk of the pulp and then through a jelly bag. Never disturb the pulp in any way while straining or the jelly will be cloudy.

5. A second extraction of juice may be made from fruits rich in pectin. This is done by returning the pulp to the saucepan with sufficient water to cover and boiling for a further period. When two extractions are made they should be mixed together before cooking.

(*b*) *Cooking*:—

1. Choose a pan with a large diameter to allow rapid evaporation.

2. For good results, not more than 2 quarts of juice should be handled at a time.

3. Measure the juice, bring almost to the boil, then add sugar, stirring only till dissolved.

4. Bring jelly to boiling point and boil rapidly without the lid until jellying stage is reached. It may be necessary to skim the surface several times during cooking.

5. Test the jelly when it commences to foam up the sides of the pan. This is done by taking a little on the stirring spoon and holding horizontally well above the pan. Turn once or twice to cool the mixture slightly. If it breaks off in even sheets or flakes it requires only several more minutes' cooking. Another method is to put a little of the mixture on a cold saucer and allow to cool quickly. If it crinkles when the saucer is tilted the cooking is complete.

6. Allow jelly to stand several minutes until it stops bubbling before pouring into hot sterilized jars. Do not pour from a height as air bubbles will form.

7. Seal when cool with melted paraffin wax.

Fruit Butters.

Fruit butters are considered to be the most wholesome, as they contain a smaller proportion of sugar than fruit, and are simple to make. If desired up to half the amount of sugar may be replaced by honey.

Fruits suitable for converting into butter by the method described below are: apples, peaches, plums, apricots, tomatoes and grapes.

1. Wash the fruit and cut up if large.

2. Cook gently with the minimum amount of water till tender.

3. Rub through a sieve and measure the pulp.

4. Place the pulp in a saucepan with sugar, using ½ cup of sugar to each cup of pulp. Spices may be added if desired.

5. Cook, stirring constantly, until the mixture is thick and smooth.

6. Pour into clean hot jars and seal.

Fruit Growing—*continued from page* 303.

after being held in atmospheric temperatures for a fortnight.

These facts then point to one way in which what is now regarded as more or less unavoidable periods of excessive common storage, may be eliminated.

It is suggested that if space is available, after a week or two in common storage Granny Smiths be placed in cool store unwrapped and unpacked, and held until July when facilities are available to grade, size and oil wrap them prior to returning to cool store. Handling along these lines would eliminate, to a large extent, many of the present complaints of excessive wastage due to over-maturity disorders in Granny Smiths marketed late in the year.

Approved Vegetable Seed—June, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Cauliflower—continued.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

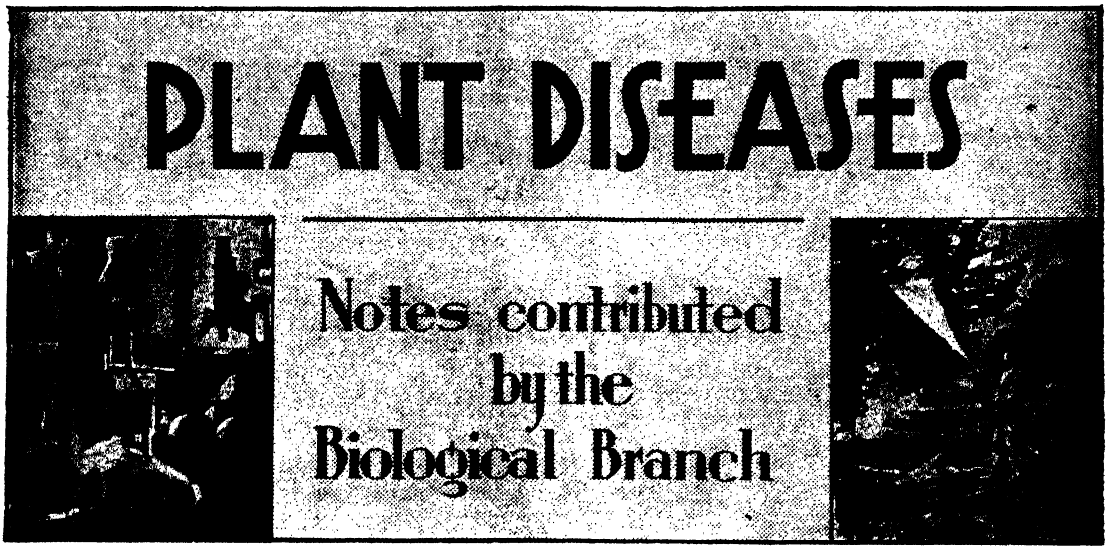
Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereington," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.



DISEASES OF CARNATIONS.

AS carnations are a biennial crop, the effect of diseases on their production can be greater than on an annual crop which can be grown quickly and harvested before losses are economically serious. Chief causes of loss are the root and crown rots, but leaf spot and rust, if allowed to become established, will impair vigour and bloom quality. Mosaic also adversely affects vigour.

Root Diseases and Crown Rot.

Four different species of parasitic fungi can attack and rot the stem at ground level, causing wilting and death of the plant. Once introduced into the soil, they will persist there for varying periods, the different species attacking at different times of the year. They are as follow:—

Sclerotium rolfsii, which is active only when the soil is warm, during the summer months. It is easily recognised by the presence of a strong, white weft of fungal threads growing over the affected parts, and by the presence of small resting bodies produced on the surface of diseased tissue; these bodies are at first white, becoming brown with age, and are about the shape and size of cabbage seed.

Rhizoctonia solani, which is most active in spring and autumn, causing a dry rot of crown tissue.

Fusarium sp., which causes a rot of crown tissues and roots and can be distinguished because the woody tissue of the stem is discoloured and brown for some inches above the rotted area. It is active at all times of the year, but plants most commonly collapse from its attack during the early summer.

Phytophthora sp., which causes a firm brown rot of crown tissues during the cooler months of the year, and is active only in very wet or badly drained soil.

Root Knot or Nematode Disease.

The nematode is a minute, worm-like organism which penetrates the roots, causing the developmnet of galls upon them. A heavy infection results in a very beaded and distorted and inefficient root system. Growth is weakened, the plant often wilts in hot weather and susceptibility to other root diseases is increased. This disease is particularly bad in light, sandy, warm soils.

Control Measures for Root Diseases.

No very effective control measures can be recommended. Losses can be prevented from becoming serious only by constant watchfulness. Diseased crop refuse must be burned and a long rotation practised. Maintenance of vigour by generous fertiliser treatment is an important factor in all disease control. Lime or dolomite also should be

Carnation Crown Rot.
A plant affected with crown rot or root rot wilts, but does not droop because of the stiff nature of the leaves.

freely used, since a neutral or slightly alkaline soil is desirable for carnations.

Sclerotium rolfsii, Rhizoctonia solani and nematodes attack a wide variety of hosts, and when they are present non-susceptible plants should be grown in rotation. *Sclerotium rolfsii* attacks particularly delphiniums, antirrhinums, carrot and beet. In addition, organic matter in the soil provides a suitable material for its growth, and no organic matter should therefore be added to the soil during the summer. A winter green crop of a cereal may be grown after the removal of a diseased crop, but should be turned in very early in the spring. *Rhizoctonia* attacks chiefly potatoes, beans, asters, stock, zinnias, cabbage and cauliflower. The nematode attacks a very wide range of vegetable and ornamental plants (Plant Disease Leaflet No. 38). The *Fusarium* which attacks carnations does not affect other plants, but may persist for many years in the absence of its host.

Carnations are particularly susceptible to attack by nematode and *Sclerotium* and cannot be grown economically in soil which is heavily infested with either of these organisms. In light soil, *Fusarium* may also be a limiting factor unless sufficient land is available to allow of a rotation of about six years.

It is, therefore, of major importance when establishing a carnation bed to avoid introducing contaminated soil on rooted cuttings, gardening implements, etc. Cuttings should be taken from strong, healthy plants and rooted either in clean virgin soil, or if this is not available, in soil sterilised by treatment with formalin or steam (Plant Diseases Leaflet No. 103).

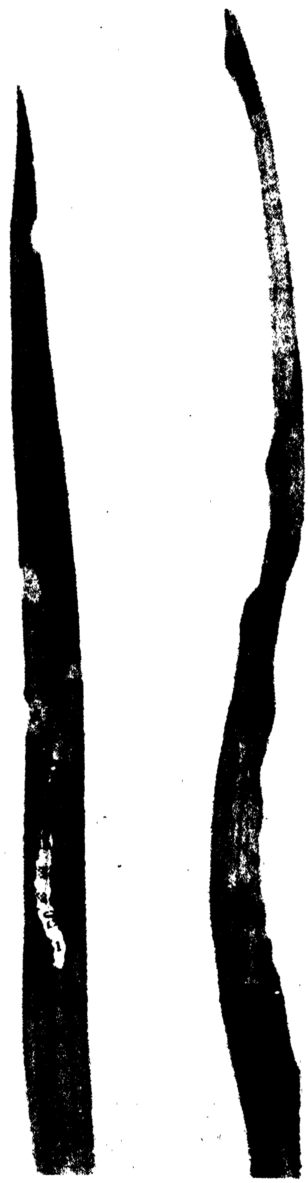
Leaf Diseases.

These are most serious under humid conditions.

Rust is caused by the parasitic fungus *Uromyces caryophyllinus.* It attacks the leaves, causing the development of round or oval blisters which burst to expose dark-brown, powdery masses of spores.

Carnation Rust.
Portions of affected leaves showing dark brown spore masses.

Leaf Spot is caused by the parasitic fungus *Septoria dianthi.* It produces light-brown or ashy spots, usually with purple margins, on the leaves, and sometimes on the stems. On these discoloured areas numerous very small black spots, the fructifications of the fungus, can be detected.



Leaf Spot.
When spots are numerous the leaf withers and dies prematurely.

Carnation Mosaic.
Symptoms of infection are light-coloured spots and streaks in the leaves.

Control of Leaf Diseases.

Cuttings should be taken from healthy plants, and if there is any danger of infection the young plants, after they have rooted and commenced to grow, should be sprayed at intervals of two to three weeks until flowering starts. Either Bordeaux mixture 1-1-20 plus white oil, 1 fl. oz. per gallon, or lime-sulphur 1 in 80 is a satisfactory spray. To make 5 gallons of Bordeaux mixture of this strength, dissolve 4 oz. of bluestone in 4 gallons of water. This can be done quickly by using a little hot water. Use only a

Twisted Leaves caused by a Check to Growth.

copper, wooden, or earthenware vessel for the bluestone. Slake 4 oz. of quick lime with a small quantity of water and make up to 1 gallon. If hydrated lime is used, half as much again will be required. Pour the lime mixture through a fine strainer into the bluestone solution, stirring all the time. Use fresh.

Mosaic (A Virus Disease).

All commercial varieties of carnation grown in this country are affected with mosaic. The symptoms are light coloured spots and streaks in the leaf tissue, most easily seen if the leaves, particularly the young leaves, are examined against the light. The nature of this virus and its mode of transmission have not been worked out in this country, but in all probability it is similar to the mosaic affecting carnations in North America. This virus is known to be transmitted from diseased to healthy plants by aphids, and possibly by pruning knives.

Reasonably good growth, in spite of the presence of the virus, can be ensured by good cultural practices. The infection is, however, probably responsible for the deterioration of carnation varieties over a period of years.

The virus is not transmitted through the seed and therefore seedlings are at first free of virus. They should be grown in isolation from infected plants to minimise the danger of the spread of the disease to them. Aphids should be kept in check.

Twisted Leaf Bud.

This rather common condition is not a disease, but appears to be brought about by a check in growth, such as might be caused by a sudden spell of cold weather.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Condobolin (N. J. Hanlin) .... August 5, 6
Albury Sheep Show and Fair (A. G. Young) .... August 5, 6, 7
Trundle (W. A. Long) .... August 12, 13
Peak Hill (C. McDowall) .... August 19, 20
Parkes (S. L. Seaborn) ..... August 25, 26, 27
Young (Thos. A. Tester) ..... September 2, 3
Wagga (G. Dewey) .... September 2, 3, 4
Forbes Show and Sports Day (E. R. Woods) .... September 6
Corowa (W. T. Easdown) .... September 12, 13
Leeton (L. C. Tweedie) ...... September 23, 24
Walbundrie (C. Leischke) .... October 1
Hay (G. Johnston) .... October 3, 4
Albury Annual Spring Show (A. G. Young) .... October 7, 8, 9

Reducing a Hive in Size for Winter Comfort.

BEEKEEPING HINTS.

TEMPERATURE EFFECTS ON BEES.

Their Influence on Management Methods.

D. L. MORISON, B.V.Sc., Veterinary Officer, Apiary Branch.

BEES are included among the "cold-blooded" creatures, which are dependent to a large extent on atmospheric temperature for their potential degree of activity. Consequently their movements are limited or inhibited by variations from the optimum temperature for their activity.

Thus, temperature is an important factor which has to be considered when managing colonies of bees. It can often limit the amount of brood reared or honey gathered, and can even cause the death of the bees.

Bees usually maintain a hive temperature in the vicinity of 34-35 deg. C. during summer. However, during the average winter, or at other times when the weather is cold and the bees are forced to cluster, the temperature of the colony fluctuates in a fairly regular manner, these fluctuations being known as "Lammert's cycles." Each Lammert's cycle occupies a period of 22-23 hours and the fluctuations are approximately as follows:—The temperature of the colony gradually falls until it is about 13 deg. C., then rapidly rises to 24-25 deg. C., and then gradually falls to 13 deg. C. again.

While the observance of colony behaviour at low temperatures has been carried out in very great detail in some countries, such as the United States of America, the information gained is not capable of such application here as it is there, owing to the very much warmer winter experienced in New South Wales. Whereas in northern America cellar-wintering and the special packing of bees for winter is often practised, in this State it is often possible to work winter "flows" from certain species of trees.

When such winter flows are being worked, however, it is important that humidity in relation to temperature be considered. The drier the air, the greater the likelihood of such a flow being worked successfully.

Effects of Too Low a Temperature on Bees and Their Activities.

The individual bee will soon die if kept at a temperature of 0 deg. C. However, it is possible to chill a bee down to this temperature for a short period, say one hour, and then revive it by re-warming. Many beekeepers have noticed that during cold weather many bees which are apparently dead at the entrance to the hive can become active again if they are placed in a warm atmosphere for a time.

The association of a number of bees together in colonies endows the colony with certain advantages, including an advantage in temperature control, which resembles to an extent the form of constant temperature control which occurs in the so-termed "warm-blooded" animals.

The ability of a colony to generate and maintain colony heat is dependent to a large extent upon its numerical strength. This is especially important when bees are working winter flows, since weak colonies in any apiary often die out while the stronger ones are prospering on a winter flow.

A low temperature may also hamper the drawing of comb, especially in weak colonies. Combs may be imperfectly drawn and the colony tend to build burr comb in the brood nest rather than draw comb in the supers, since the extent of colony heat does not allow of their activities elsewhere in the hive.

The speed with which a hive containing bees can be opened up and manipulated depends to a large extent on the temperature within the hive. If the interior of the hive is cold, the propolis between the combs is very hard and brittle. Combs may be very difficult to remove with perhaps resultant damage to the frames. The brittle nature of the propolis also results in much jarring of the bees when the combs are being separated.

Too low a temperature results in retarded development of the brood in the hive, and should a cold "snap" be experienced, or the brood be removed during cold weather, as when extracting operations are being carried out, the brood may become "chilled" and die. Of course, the time of exposure of brood as well as the actual temperature is important.

The manipulation of hives of bees during very cold weather is not only undesirable for the above reasons, but also because bees may be very vicious if disturbed in very cold weather and are likely to crawl rather than fly. They may crawl on the person manipulating the hive, causing inconvenience. If shaken outside the hive, they cluster in small groups for warmth, and since these small clusters are unable to retain sufficient warmth the bees are likely to die.

Effects of Too High a Temperature on a Hived Colony of Bees.

If the temperature in a hive rises much above 34 deg. C., the bees will attempt to reduce it. They do so by ventilating the hive by fanning air in at the entrance, and they may also carry water and deposit it in various cells about the hive. The evaporation of this water has a cooling effect on the colony. If the bees are unable to cool themselves in the hive, they are forced to cluster outside the entrance—known as "hanging-out."

During very hot weather it may be inadvisable to open hives of bees, since this may destroy their "air-conditioning" system. If bees are shaken on to hot ground during a heat wave, especially if in the sun, they may be stupefied by the heat and die before they can regain the hive.

The effect of high temperatures on the comb can also lead to disastrous results within the hive. The comb may sag, buckle and collapse, and any honey it contains be smeared on the colony of bees, possibly killing it outright. This sometimes occurs when hives are being moved long distances on hot days and become overheated. New combs heavy with honey are the first to be affected by any overheating.

Hive Management During Adverse Temperature Conditions.

The apiarist can, by efficient management, lessen the effects of variations of temperature from the optimum.

When the Temperature is Below the Optimum.—Under these conditions, the following methods will be found useful in promoting the welfare of the bees and consequently in assisting to maintain honey production :—

When a cold period is anticipated, every effort should be made to see that the colonies are of good numerical strength with adequate stores, so that they can generate and retain sufficient heat.

The hives should be placed in a sheltered location with a sunny, north-easterly aspect.

Excess supers should be removed from the hives so that there will be less surface area for the loss of hive heat. If the entrance is large it may be partially closed to restrict the passage of air.

The special packing of weak colonies with insulating material may be worth while in some instances. In some countries, special packing for winter, cellar wintering, and the electrical heating of hives have been carried out during cold weather. However, it does not appear at present that any of these practices will find a place in commercial apiculture in New South Wales.

When the Temperature is Above the Optimum.—While keeping stationary hives of bees cool is important at times, it is usually during the moving of colonies of bees a long distance during hot weather that trouble occurs from overheating.

To keep stationary hives cool they should preferably be located on a shaded site. If they are in the sun painting the hives white, results in the absorption of less heat. Dark-coloured hives tend to absorb much more heat from the sun's rays than do those painted white; this may be an advantage in winter, but is not in summer.

Allowing the bees plenty of ventilation by staggering the supers or increasing the size of the entrance will often assist them to cool their hives in summer. The bees should also be near a source of water which they can carry to their hives for evaporation purposes.

Keeping Hives Cool When Moving Them Long Distances.

Moving strong colonies of bees long distances in very hot weather is rather a risky procedure, and transporting bees in such weather should be avoided, if possible.

The following will help to prevent losses due to overheating in transit:—

1. Move the bees at night, as it is then cooler and, moreover, there is no light falling on the screens, which results in far less excitement than if the bees were moved during the day.

2. The bees should not be allowed to remain on the truck for any longer than is absolutely necessary. They should be promptly unloaded at their destination. Many colonies of bees have been lost through beekeepers allowing them to remain on the truck while looking for a suitable site.

A load of bees should be parked in the shade, if possible, when stops have to be made.

Rock Melon in New Form.

Successful Canning Tests.

HOUSEWIVES are promised something novel in dessert dishes, and rock melon producers a new outlet for their product, if canners are attracted by the idea of extending departmental experiments to the point of commercial production.

Canning tests initiated by Mr. A. C. Orman, Special Agricultural Instructor of the New South Wales Department of Agriculture, in collaboration with Mr. L. J. Lynch, Canning Research Officer of the Council for Scientific and Industrial Research, are stated to have been highly successful, the general quality of the product being impressive from the standpoints of flavour, texture, consistency and appearance.

The rock melons were diced and canned alone, and in combination with passion-fruit and citrus juice. From the point of view of suitability for commercial purposes, the rock melon-passion fruit pack appeared to be the best. The fruits appeared to blend very well, whilst the rock melon flavour and aroma was almost completely retained. Contrary to general expectations, the diced melon did not slough or break down, a fact of considerable importance.

The varieties tested were Jade Beauty, Honeydew (both green-fleshed varieties), Powdery Mildew Resistant 45 and Powdery Mildew Resistant 5-50 (both yellow-fleshed varieties).

In departmental opinion, the quality of the product is such that there should be little difficulty in establishing it on the market. Advantages of rock melon in this form are that it is available when the fresh fruit is not in season and that it may be put in a refrigerator or ice chest without effect on the flavour of other foods. It can be used in the making of fruit salads and a variety of other forms of dessert.

The Business of Farming.

Importance of Accurate Records.

REALISING that, in the long run, the prosperity of Australia's agricultural industries depends not merely on efficient mechanical methods but also on efficient business management the Division of Marketing and Agricultural Economics some four years ago designed a series of Farm Record Books, suitable for various types of farms, which enable any farmer, no matter how small his knowledge of book-keeping, to keep adequate records of his finances and his production.

It is, therefore, encouraging to know that during the past two years many hundreds of farmers have purchased and used these Farm Record Books.

The Book Completely Revised.

Based on the experience of the past four years the Record Book has now been completely revised; the instructions have been improved and simplified, and the important final section dealing with the analysis of the completed records has been re-written and considerably amplified.

The revised book makes it quite an easy matter for any farmer to work out his profit on his year's operations; it enables him to find his return on capital and to get a good idea of what he has obtained for his own labour, while it also makes possible a yearly comparison of costs to mention but a few of the uses to which the book may be put.

Apart from anything else the book greatly facilitates the compilation of taxation returns and, whether the farmer compiles his own return or has it done for him, the major part of the book is well worth keeping for this purpose alone. The book is designed to cover the taxation year and must be commenced on the 1st July each year.

Books are available to suit three types of farms—

(i) Wheat-sheep.
(ii) Dairying.
(iii) Horticulture and small mixed farms.

They may be purchased from the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney. The price is 2s. 6d. (including postage).

The future prosperity of Australia depends, very largely, on the prosperity of her primary industries, and the prosperity of those industries will, in the final analysis, depend upon efficiency in production. To-day no farmer can accord haphazard business methods. Without adequate records no farmer can avoid them!

Prevention of Parasitic Infestation in Stock.

CERTAIN general measures of good management go far to prevent infestation of stock with lice, mange parasites, and other pests. Of such measures, the chief are as follows:—

(1) The building of pigsties, stables, cow-sheds, and calf-pens with sound material which does not afford cover and lodgment for parasites.

(2) The maintenance of all such buildings in a thoroughly clean condition, and the admission of ample light and sunshine.

(3) The regular and thorough grooming of horses and cows and the washing of pigs.

(4) The prevention of overcrowding, particularly of pigs and calves.

(5) The isolation of infected animals.

(6) The cleaning of grooming gear.

(7) The inspection of stock before purchase by the buyer.

Where parasitic infestation has taken place, measures must be taken to deal with the parasite in the animal, but the wonderful effect of good food in safeguarding stock from the ill effects of parasitic attacks must never be forgotten—in very few cases can the administration of drugs compete with good feeding.

Use of Wines with Meals—*continued from page* 310.

burgundy (or in its absence a claret), and with the dessert a sparkling wine or port.

Should nuts be on the table, a good brown muscat of liqueur type would be very suitable.

It is not necessary, however, to have a wine with every course, and where only one wine is served, it should be served with the main course such as the roast, using a light white wine for white meat, and red for red meat.

How to Make Bordeaux Mixture.

And Formula for Bordeaux Paint.

BORDEAUX mixture is a spray used almost exclusively for prevention of fungous diseases of the foliage and above-ground parts of plants. It is prepared by mixing together a bluestone (copper sulphate) solution and a lime suspension in one or other of the ways described below. It is often advisable to add a spreader to the spray mixture in order that it may spread satisfactorily and adhere to the surface of the leaves or fruit. In order to obtain best results, Bordeaux mixture should be used immediately it is made.

Bordeaux mixture is used at different strengths, which may vary according to the crop to be sprayed or the disease to be controlled. One strength of Bordeaux mixture is 6-4-40. The first figure (6) in this formula indicates the number of pounds of bluestone, the second figure (4) the number of pounds of lime, and the third figure (40) the number of gallons of water in the mixture. In the same way Bordeaux 6-4-80 contains 6 lb. of bluestone, 4 lb. of lime, and 80 gallons of water, and Bordeaux 1-1-10 is prepared from 1 lb. of bluestone, 1 lb. of lime, and 10 gallons of water. There are various other formulae, but they can all be read in the same way.

The recommended quantities of stone lime or hydrated lime are in excess of the amounts actually required to neutralise the bluestone, but they make an alkaline mixture which, in Departmental experience, gives best results.

Ingredients.

Bluestone sold commercially is usually of quite satisfactory quality. It may be obtained either in the form of large crystals or fine powder.

Warning.—Bluestone should always be dissolved in a wooden, earthenware, or copper container. Iron and galvanised iron vessels should not be used, as the bluestone solution will rapidly corrode them.

The lime used in preparation of Bordeaux mixture should be freshly burnt stone lime (quicklime) or good quality, new season hydrated lime. In the latter case the amount required is one and a half times the quantity stated for stone lime, *e.g.*, instead of using 4 lb. of stone lime, 6 lb. of hydrated lime are necessary.

Preparation of Bordeaux Mixture.

It is essential that Bordeaux mixture should be properly prepared if best results are to be obtained from its use. The quality is largely dependent on the fineness of the particles in the mixture. The coarser the particles the quicker will they settle out and the less adhesive will be the spray residue left on the plant or tree.

A properly prepared Bordeaux will not commence to settle for some minutes and the greater proportion will remain in suspension for some time. The suspension should be kept thoroughly agitated during spraying.

The following methods refer to the preparation of 6-4-40 Bordeaux. When this formula is to be varied, corresponding changes must be made in the amounts of bluestone, lime and water required.

Let it be assumed that 40 gallons of 6-4-40 Bordeaux are to be prepared, and one barrel, or a spray outfit, is available.

(*a*) Dissolve the bluestone (6 lb.) in 9-10ths of the water (36 gallons) in the barrel or spray tank. If the bluestone is in the form of large crystals it may be tied loosely in a hessian bag and suspended just below the level of the surface of the water overnight until dissolved. It can be dissolved more quickly if a few gallons of hot water are slowly poured over it. If thrown loosely into the bottom the crystals will not dissolve unless the mixture is constantly stirred for a long period. If the blustone is in the form of small crystals or fine powder, the required quantity may be washed through a sieve into the barrel or spray

tank, when it may be dissolved after slight stirring or agitation of the liquid.

(*b*) Slake the lime (4 lb.) in a kerosene tin or other conveniently-sized container, add small successive quantities of water to the lime until it crumbles and powders, when more water is added to provide a milky mixture, and finally make up to 4 gallons. If hydrated lime is used, mix 6 lb. into a paste with water and make up to 4 gallons.

(*c*) Slowly pour the lime through a fine mesh strainer into the bluestone solution in the wooden barrel or spray tank. Particular care must be taken to stir the bluestone solution with a wooden paddle whilst the lime is being added, otherwise an inferior Bordeaux will result. In the case of a power spray the agitator should be set in operation.

Stock Solutions.

If large quantities of Bordeaux mixture are being used it often saves time and is more convenient to make a stock solution of bluestone for use as required. Such a stock solution can be made in a large wooden barrel of a strength, say, of 1 lb. to 1 gallon of water. When mixing the spray, 1 gallon of this solution is used for every pound of bluestone required. A mark should be made at the level of the liquid after removing any of the stock solution, so that if evaporation occurs it can be compensated for by adding more water before the next quantity is measured out.

In a similar manner a weighed quantity of lime can be slaked in a large receptacle and made up to a definite volume. One pound of lime to 1 gallon of water will make a suitable stock solution. The lime suspension should be well stirred before removing any for use. Provision should be made, as in the case of the bluestone stock solution, to allow for compensation for water lost by evaporation.

In each case the stock solutions should be kept well covered when not in use.

When preparing spray from stock solutions, proceed as directed originally when using solid materials, but in this case read gallons instead of pounds; *e.g.*, if 40 gallons of 6-4-40 Bordeaux are required, first dilute the 6 gallons of bluestone stock solution to 36 gallons, then pour in the 4 gallons of limestone stock solution. Do not mix the stock solutions together; always dilute the bluestone stock in any case before mixing.

When Large Quantities are Required.

Users of large quantities of spray may find it more convenient to instal a series of vats or tanks in such a manner that the bluestone solution and the lime solution may be run simultaneously into a large vat or tank. This in turn is so placed that the Bordeaux mixture thus prepared may be conveniently run into a power spray or suitable vehicle for transferring the spray to the orchard or vineyard.

Bordeaux Formulae.

Composition of the spray may vary considerably according to the crop and the condition of growth at time of application.

Some examples are as follow:—

Pome fruit: 6-4-40 (spur-burst strength).

Stone fruit: 6-4-40 (bud-swell stage).

Grapes: 6-4-40 (early bud burst).
6-4-50 (summer strength).

Passion fruit: 4-4-50.

Vegetables: 1-1-20.

Citrus: 1½-1½-80 (with ½ per cent. white spraying oil added as a spreader. The oil, approximately ½ gallon, is first diluted with an equal quantity of water and is then mixed with the Bordeaux immediately before use).

Further details on the correct formulae for diseases of different crops are given in leaflets dealing with specific diseases. Write to the Department of Agriculture, Box 36A, G.P.O., Sydney, for a copy of the "List of Publications."

Bordeaux Paint.

This is simply Bordeaux mixture, but with such a small proportion of water that a paint is produced.

The formula is:—

Copper sulphate: 1½ lb.

Lime. 1 lb.

Water: 2 gallons.

The copper sulphate is dissolved in approximately 1 gallon of water, the lime is broken down with the remainder of the water, and is then poured into the bluestone solution to form the paint.

Infectious Sinusitis.

A Common Disease in Turkeys in New South Wales.

L. HART, B.V.Sc., H.D.A., Veterinary Research Officer.

A DISEASE of turkeys characterised by inflammation of the lining membrane of the infraorbital sinuses occurs rather widely in New South Wales. These sinuses are cavities below and in front of the eyes, which are in communication with the nasal passages. The disease is infectious, and appears to be contagious, although infection by contact has not been accomplished experimentally.

Only turkeys are known to be susceptible to the disease which appears to be most prevalent in birds 3 to 5 months old, but may attack adult birds, and, although the mortality in older birds is usually low a heavy financial loss is sustained due to retarded growth. Birds a few weeks old may be affected and in these mortality may be high, one owner reporting the total loss of a flock of 800.

The cause has not been determined, but it appears likely that it is a virus too small to be seen with the aid of a microscope.

Symptoms.

In the initial stages affected birds may shake their heads violently, and, on close examination, clear nasal exudate may be seen. The secretions from the eye become frothy, there is profuse, clear nasal discharge and the sinuses swell, resulting in bulging beneath and in front of the eyes. One or both sinuses may be involved and the swelling may be so great as to close the eye.

Occasionally the breathing becomes laboured due to involvement of the windpipe and lungs, or blockage of the nasal passages by the swelling. Unless the vision is impaired the appetite usually remains good but the birds lose condition. The exudate in the sinus is, at first, thin, but soon becomes viscid and in a large number of cases subsequently cheesy.

Spontaneous recovery occurs in some birds, but often the condition persists for months, and when the sinus content becomes cheesy it continues indefinitely.

Post-mortem Examination.

Usually only the sinuses are involved; these may be distended with watery to thick, sticky exudate, or in old cases with cheesy masses. Occasionally cheesy exudate is present in the air sacs and the lungs may be inflamed or consolidated. If the lungs are affected exudate is usually present in the air tubes.

A Case of Infectious Sinusitis.
This bird was artificially infected by injection of exudate into the sinus.

Differential Diagnosis.

The disease may be confused with:—

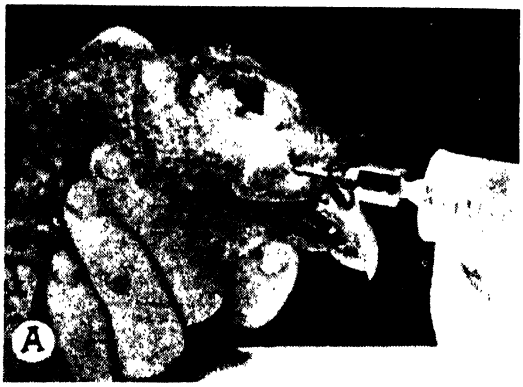
A. Fungus infection of the lungs.
B. Foreign body sinusitis.
C. Green feed deficiency disease.

In fungus infections there is no involvement of the sinuses, and usually only a few birds are affected.

Sinusitis caused by a foreign body such as a grain of wheat is usually unilateral.

Turkeys require two to four times as much vitamin A in their ration as do fowls, and this is normally supplied by feeding adequate quantities of green feed. When green feed is absent or in short supply it is necessary to feed a vitamin A supplement, such as cod liver oil (1 per cent. of a good

quality cod liver oil should be sufficient). In newly hatched poults symptoms will appear in three to four weeks if no vitamin A is fed; the birds appear listless, walk unsteadily, eyes water and milky exudate which later becomes cheesy, collects in the eyes and sinuses. Usually 100 per cent. mortality occurs within two weeks of appearance of symptoms if no vitamin A is given. Similar symptoms are seen in older birds, but the swelling of the sinuses is usually more pronounced. Post-mortem examination reveals cheesy masses in the sinuses, whitish spots like pustules on the membranes of the mouth and gullet, and in young birds cheesy material in the anal bursa, a small sac found in the abdominal cavity attached near the end of the digestive tract. All these changes may not be present in each bird.



Treatment of Infectious Sinusitis.
Method of insertion of the hypodermic needle into the sinus for the withdrawal of exudate and inoculation of remedy.
[After Hinshaw.

Prevention and Treatment.

The cause of the disease is not known and its contagiousness has not been proved, but observations in the field indicate that it spreads rapidly, and it is likely that some birds which recover remain carriers. It is recommended, therefore, that young birds be reared isolated from adult stock, especially if an outbreak of sinusitis has occurred the preceding season, and that unless specially required for breeding purposes, all birds which have recovered from an attack be disposed of before the hatching season.

A diet adequate in vitamin A is essential.

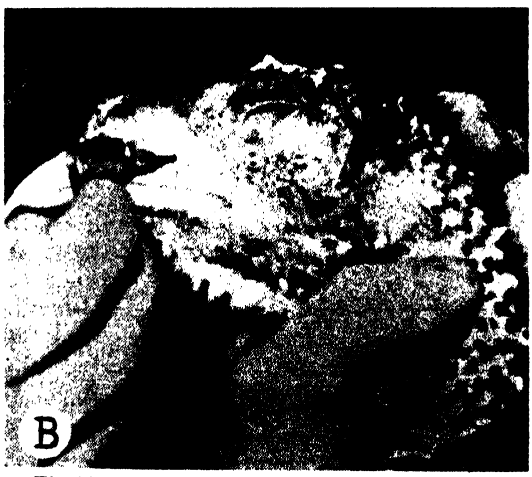
When sinusitis is suspected to be present in a flock a competent authority should be consulted for a correct diagnosis before treatment is commenced.

To be effective treatment must be carried out in the *early stages* whilst the sinus exudate is fluid. Two 5 or 10 mls. syringes, a few 15 or 16 gauge hypodermic needles about 1½ inches long, and a supply of 4 per cent. solution of silver nitrate, together with rubber gloves for the operator, are required.

A needle is inserted into the sinus through the skin and sinus membrane, the syringe is attached and the sinus contents withdrawn. The needle is left in position and with the second syringe 1.0 ml. of the 4 per cent. silver nitrate solution is injected, and the sinus gently massaged. The needle is then withdrawn.

Considerable swelling takes place, but usually subsides within two or three days, and recovery is usually complete within ten days. A second treatment may be necessary in some cases.

Do not inject the silver nitrate into the tissue, but into the cavity of the sinus or sloughing will occur; *do not* give an excessive dose; and remember that silver nitrate is caustic and stains, so avoid getting it on the hands.



The Needle Left in the Sinus after Withdrawal of the Exudate, Prior to the Introduction of the Therapeutic Agent.
[After Hinshaw.

If the exudate is cheesy it is necessary to lance the sinus, remove the contents and pack with cotton wool soaked in the silver nitrate solution. This treatment must be repeated every few days until improvement is noted.

When lungs and air sacs are involved there is no satisfactory treatment.

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

FEEDING IN DAIRY HERD MANAGEMENT.*

THE subject of feeding in relation to dairy herd management can be conveniently discussed from three aspects—what the position is; what it should be; and what should be done to make it what it should be.

What the Position Is.

The general position on the coastal dairy farm is a peak of milk production in the spring when the paspalum and natural pastures are at their best, a progressive fall in production as the pastures mature, a rapid fall in autumn as the bulk as well as the quality of the pasture decreases, and a period of very low production in the winter, with the cows coming into the spring in poor condition. Coupled with this is insufficient fodder conservation, and insufficient pasture management and improvement. The result is extreme dependence on seasons, violent fluctuation in production and poor average production.

The average butter-fat per cow for New South Wales is 150 lb. Good feeding should allow 250 lb.

What the Position Should Be.

The aim is—"a full feed of good feed throughout the year." That is, the cattle should receive a sufficient bulk of feed throughout the year, and the feed should be properly balanced, particularly as regards protein.

What Can be Done About It?

The requirements of a "full feed" and of "good feed" are the key points.

A full feed means, firstly, pasture improvement to provide winter-growing grasses. Pasture is the cheapest source of feed, costing $\frac{1}{10}$ - $\frac{1}{8}$d. per food unit, as against ½d. in conserved fodder. Secondly, it means supplementing inadequate pastures; this means more fodder conservation, more grazing crops, and the use of concentrates.

"Good feed" means feed adequate in protein. This means pasture management, subdivision, rotational grazing and mowing to allow re-growth. Pasture 4 to 6 inches in height contains up to 20 per cent. protein; pasture flowering and seeding may only contain about 8 per cent. Pasture management means ensuring a continuous supply of young, leafy pasture, rich in protein.

Where pastures are inadequate, "good feed" means ensuring that the feed has sufficient protein from one or more of three sources—grazing crops such as lucerne or cowpeas, or young oats; conserved fodder such as lucerne or clover hay; or protein concentrates, such as linseed meal. Insufficient protein means low production, even though the cattle may be in good condition.

Most profitable production depends on judicious feeding of concentrates, except perhaps during the spring flush. With average coastal butter-fat prices, and the average cost of concentrates on the coast, the most profitable level of concentrate feeding is 1½ to 2 lb. of concentrates for each gallon of milk produced by a cow. A small box on the bail door is sufficient for feeding this amount if no feeding bails are available. The protein content of the concentrates should depend on the protein content of the other feeds. With poor pasture, or maize or sorghum, green fodder or silage, concentrates with 20 per cent. or more protein are necessary. With protein-rich lucerne hay, the low protein crushed grains, such as wheatmeal, crushed oats, or grain sorghum meal are quite sufficient.

*Summary of an address given to the Taree Agricultural Bureau Conference at Dumaresq Island on 15th May, 1947, by Mr. G. L. McClymont, Veterinary Research Officer.

Purchase of feed should depend on the cost of food units. Food units in hay at £10 per ton cost 3d. each; in concentrates at £9 per ton, 1½d. each. Tables on food values and costs are available from the Department.

Mineral requirements can be met by top-dressing pastures with superphosphate which also results in more protein-rich clovers, or by feeding bone meal direct to the cow, 1 to 2 ozs. per day in the feed, or as a lick. Any obscure unthriftiness that does not respond to bone meal or better feed may possibly be due to a deficiency of one of the "trace" elements, copper or cobalt. If any such unthriftiness is observed, the local Stock Inspector or District Veterinary Officer should be contacted for advice.

Yeast for Poultry Food.

A CONSIDERABLE amount of dried yeast has recently been released by the Disposals Commission for stock feeding, and inquiries have been received as to its food value.

Its main value is a very high content of riboflavin, the vitamin essential for maximum hatchability of eggs and growth of chickens. Dried yeast contains 30 to 50 micrograms of riboflavin per gram in comparison with 20 to 30 in milk powders; it can therefore be used as a very efficient substitute for milk powders, which are in short supply. It is also rich in protein, containing about 40 per cent. Dried butter and skim milk contain about 34 per cent., and dried whey, 12 per cent. protein. The dried yeast equivalent of milk powder could be taken as ¾ lb. yeast to 1 lb. of milk powder.

Breeding rations and chicken rations should have up to 10 per cent. of milk powders or dried yeast for best results. Where neither is available, 1 gram of synthetic riboflavin per ton of feed can be taken as equivalent to 5 per cent. of milk powders in the total ration. Directions for use of synthetic riboflavin are contained in a pamphlet available from the Department.

Occurrence of Dodder in Carrot Crops.

Prompt Eradicative Measures Necessary.

A CIRCULAR issued by the Division of Plant Industry of the Department of Agriculture in relation to the occurrence of dodder in carrot crops in the Murrumbidgee Irrigation Area this summer gives the following information concerning the infestation, the appearance and habit of growth of the weed, and the measures necessary for its eradication:

"Dodder is a parasitic plant which is generally associated with lucerne production. There are several different species of dodder, that found on the Irrigation Area being identified as *Cuscuta australis* or Native Dodder. This species, however, is synonymous with *Cuscuta obtusiflora*, which is a native of the warmer parts of America.

"Departmental officers stationed at Leeton and Griffith have endeavoured to determine the extent of the infestation on the Irrigation Area and it appears that there are approximately fifteen farms affected. Action has been taken to have all affected carrot plants removed from the ground, bagged on the spot and then burnt.

"A close watch should be kept for the appearance of this plant, particularly in carrot crops. There is little doubt that the present infestation is the result of the distribution of one consignment of imported carrot seed which was brought into the country during 1944. Up to the present date, all crops that have been found to be infested are crops that have been produced from seed obtained from the one seed merchant.

"Dodder is of course a particularly serious weed, and once it has gained a hold on any area it is particularly difficult to eradicate and may even mean the cessation of susceptible crops on infested land for a period of years.

"Dodder has long leafless stems, orange-yellow in colour. The dodder seed germinates in the ground and the young plants attach themselves to the carrot tops or whatever other suitable host plant happens to be present. As soon as the thread-like vine is firmly attached to the host plant, the stem connecting it to the ground withers away and the dodder then draws its sustenance from the host plant by means of tiny suckers which enter the tissues of the host plant. The dodder flowers are a beautiful gold colour.

"The weed is quite easily discernible, and where it appears action should be taken to immediately cut the patch or patches, bag them and then burn. Care should be taken not to drop any of the pieces of thread-like vine, as these pieces can immediately attach themselves to other plants and again commence to grow. Dodder grows exceptionally quickly and develops a tremendous number of these thread-like vines. It is also a very prolific seeder and therefore every endeavour should be made to destroy it wherever it appears before it sets seed."

Cockerels Reserved for Stud Purposes.

Poultry Notes.

June, 1947.

E HADLINGTON, Principal Livestock Officer (Poultry).

THE REARING SEASON.

ON all farms where breeding operations are carried out the breeding stock should now be settled down in the pens ready for the season. Assuming that prior attention has been given to the selection of suitable birds for the breeding pens, the next important consideration is the rearing of chickens.

The success of any farm depends largely upon the raising of satisfactory pullets, and it is safe to say that many flocks would be more profitable if better methods of brooding were adopted. Because of the vital importance of this work, every poultry farmer should endeavour to see that the brooding and rearing equipment are efficient and adequate for handling the number of chickens desired. In many instances, however, makeshift breeders are utilised for rearing the chickens.

There is ample evidence on leading commercial farms, also on Departmental Farms, that chickens can be raised with a minimum of loss where suitable brooding facilities are provided. In many instances beginners concentrate on providing good adult accommodation, and adopt improvised methods of rearing chickens, instead of reversing the order and ensuring that the rearing equipment is the best obtainable. The financial loss incurred by heavy mortality amongst chickens is greater than the cost of providing suitable equipment—to say nothing of the anxiety and worry caused by heavy losses.

Although disease may be partly responsible for losses, it should be realised that unsatisfactory rearing accommodation is a contributing factor by lowering the resistance of the chickens to infection, and the losses through disease are often increased by faulty management and unsuitable brooders.

Essentials to Success.

There are many different systems of brooding, which, if properly managed, will

give satisfactory results. The main principles of management apply to all types of brooders.

First of all good healthy chickens must be produced or purchased, and those who purchase chickens should pay particular attention to the source of supply to ensure that the chickens are bred from well selected stock, and where possible, an inspection of the farm should be made to ascertain the class of stock kept, and whether the chickens are bred on the farm or eggs purchased for hatching. It stands to reason that chickens produced from unselected stock are likely to be more difficult to rear than those bred from sound, well selected birds.

After ensuring, as far as possible, that the chickens are bred from sound stock, the main factors to take into consideration in raising them are as outlined hereunder:—

1. There should be ample brooder accommodation to avoid overcrowding. It should be realised that most brooders are sold on their day-old capacity, which means that if the chickens are kept in them until, say, six weeks of age, the numbers would have to be reduced by nearly half.

2. It should be possible to generate sufficient heat in the brooders to keep the chickens comfortable even in the coldest weather, so that they will not pack together, and yet to allow ample ventilation. Any brooder which necessitates closing up to maintain the desired temperature is likely to cause mortality through lack of ventilation. A brooder should be capable of maintaining a temperature of at least 90 degrees for the baby chicks during the coldest nights, and also in the day time.

3. There should be no obstruction near the brooder to prevent the free movement of the chickens if they become uncomfortably warm.

4. It is as important that the temperature in the brooder be warm enough in the day time, as it is that it be warm at night—so that the chickens can go under the brooder and get warm quickly before running out again.

Breeding Pens.

5. The brooders should be kept in a hygienic condition, and the inside floors should be kept dry.

6. The brooder house should be well lighted, and ventilated, and to ensure this, windows about 3 feet x 2 feet in size should be fitted at each 8 feet to 10 feet of the length of the building, both front and back.

7. The chickens should be allowed to run outside in the sunlight as much as possible, and when the weather is favourable, they could be let out at 4 to 5 days of age. If reasonable protection from cold winds is provided, they can be allowed to stay out except in the coldest weather.

8. Where several lots of chickens of the same age are being brooded there will be a percentage of small ones in each group. If these are graded so as to have

the largest and smallest in separate pens, it will be found that the smaller birds will benefit by separation, whereas if different sizes are allowed to run together the smaller chickens do not obtain their full share of feed, owing to being bullied by the larger ones.

Attention to these matters will ensure greater success in rearing chickens, and result in more profitable pullets.

Management of Breeding Stock.

By giving attention to a few details in the management of breeding stock a good deal can be done towards maintaining satisfactory hatching results.

The first consideration is to see that the male birds are kept in good condition and free of body parasites. A check should be made every few weeks during the season to ascertain if any of the birds are losing condition, and at the same time they should be examined for the presence of body lice. In the case of single breeding pens if any of the males are found to be losing weight the best course is to give them a feed of grain at midday by shutting the hens in the houses, leaving the males in the yards long enough to have a good feed. Where flock matings are used it is somewhat more difficult to feed the males separately, and the alternative is to nail a few shallow tins on the walls of the houses out of reach of the hens, and fill them with grain.

If the birds are found to be infested with body lice the quickest method of treating them is to paint a narrow strip of nicotine sulphate (Black-leaf 40) along the top of the perches or trickle a thin line along the perch with an oil can. This should be done preferably on a still evening at dusk; if applied much before the birds go to roost, the fumes will be dissipated and the treatment will not be effective.

A watch should also be kept for mites in the houses, or, in the case of country districts, for fowl ticks. If the mites are found on the underside of the perches, these can be treated by painting with creosote and allowing it to soak in before placing the perches back into position. An application of this oil every two or three months will usually keep the mites in check, but if they spread to the walls of the houses it becomes necessary to spray the houses thoroughly both inside and outside including the roof, floor, nests, etc., and repeat the spraying in a week, or in cases of heavy infestation three or more weekly sprayings may be required.

One of the cheapest and most effective sprays for the purpose is kerosene emulsion which is made by taking ½ lb. of finely cut soap and dissolving it in boiling water; then adding slowly a gallon of kerosene stirring the mixture thoroughly while the kerosene is being added, and for a few minutes afterwards. This stock solution is then added to 8 gallons of tap water, and is ready for use.

The mixture used in the same way is also effective against fowl ticks, and

A Coke Colony Brooder.

painting the perches with creosote will afford a measure of protection against this deadly parasite.

Subsidy on Imported Stud Poultry and Eggs.

The subsidy scheme to assist importers of pedigree stock is to be extended to include importation of stud poultry and settings of eggs for hatching from Great Britain, Northern Ireland and Eire.

At its last meeting the Australian Agricultural Council agreed to extend the subsidy scheme, and it was proposed to pay £1 10s. per bird or setting of sixteen eggs for hatching.

The question of freight rates for stud poultry imported under the scheme has been referred to the Overseas Shipping Representatives' Association, Sydney, and it is hoped that poultry imported by sea will be carried at reduced freight rates as applies to other species of stock eligible for importation under the subsidy scheme.

Those wishing to import birds or eggs under the subsidy scheme should make application to the Chief, Division of Animal Industry, Department of Agriculture.

The Law on Weed Control.

A Publication Necessary to Every Farmer.

IT is a common fallacy among newcomers to gardening that there is some quick and unlaborious method of getting rid of weeds, but farmers have no illusions on the point. They know only too well that there are few short cuts to weed eradication. That science has devised certain aids they are aware—the recently developed "selective" weedicides are an example—but they realise that in many cases eradication can only be achieved after a long, patient, and perhaps costly battle, sometimes involving a radical amendment of the farming programme.

This fact is recognised in New South Wales legislation relating to the weed problem, points out Mr. A. Pearson, Weeds Officer of the Department of Agriculture, in a just-issued publication entitled "The Law and Noxious Weeds," which sets out the sections of the Local Government Act dealing with such weeds:

"Amendment to the Local Government Act in 1937 practically constituted a re-drafting of the old section dealing with weeds. Very few people realise that the Act does not necessarily insist upon the complete eradication of any weed following its declaration as a noxious plant, but allows a shire or municipal council to specify particular control measures which must be taken. It has been thought advisable, therefore, to print the weed section of the Act in bulletin form to make it readily available to all interested parties, including farmers and graziers."

The bulletin should be on the bookshelf of every owner or occupier of land. It is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Harvesting of Citrus Fruit.

Points in Picking and Packing.

THOUGH citrus fruits may not show injury from bruises for some time after picking, in reality the oil cells of the skin are very easily damaged, and it is through such injuries to the skin that decay organisms, such as those causing blue mould, make their entrance.

Great care is therefore necessary when picking and packing for market. Gloves should be worn or the finger nails kept extremely short, and the fruit should be picked or clipped with the button adhering, but no length of stalk that will come into contact with and puncture other fruit. The fruit should be placed right into the picking receptacle, and not dropped in from the top, and the same care should be exercised in all subsequent handling between picking and packing.

Though paper lining, by checking the circulation of air in the case, may tend to produce conditions favourable for the development of blue mould, the rough timber of unlined cases injures the skin and allows infection by disease so that lining-paper is an advantage at times when packing citrus fruits. The best quality citrus fruit should be wrapped in sulphite tissue, case lining paper being dispensed with.

The cases should be well packed, and filled to a height of from 1½ to 2 inches above the top of the case, which will ensure a good bulge. Light softwood cases may have a greater bulge than heavier or hardwood cases.—DIVISION OF HORTICULTURE.

THE EFFECT OF FEEDING A HIGH PERCENTAGE OF MEAT MEAL IN THE POULTRY RATION.

L. HART, B.V.Sc., Veterinary Research Officer, and D. C. DUNCAN, Manager, Poultry Experiment Farm, Seven Hills.

FROM time to time the question as to whether a high percentage of meat meal in the rations of laying stock has a detrimental effect on the keeping quality of eggs has been raised. Adverse reports on some of the eggs exported to Great Britain just prior to the outbreak of war brought the subject into prominence again, and the New South Wales Egg Marketing Board requested the Department of Agriculture to carry out experiments to determine the matter. The Chairman of the Egg Board offered the co-operation of his staff in any experiments which were designed.

It was decided to carry out the work at the Seven Hills Poultry Experiment Farm, by feeding one group on a control ration containing 6½ per cent. meat meal, and another group 12 per cent. meat meal.

At the same time a third group was included to ascertain the effect on egg production of increasing the meat meal in the ration from 6½ to 10 per cent. from December, and continuing this throughout the autumn. This was done because in tests carried out at Hawkesbury Agricultural College, there had been some indication that birds receiving 10 per cent. meat meal showed better production during the late summer and autumn.

To ensure that the protein of the rations was maintained at as even a level as possible, a portion of each new supply of meat meal was submitted to the Chief Chemist for analysis.

The results of these experiments showed that a high percentage of meat meal (12 per cent.) did not have any harmful effect on the keeping quality of the eggs, and that the increase of meat meal from 6½ to 10 per cent. in the summer and autumn failed to give increased production.—E. HADLINGTON, Principal Livestock Officer (Poultry).

1.—Effect of High Percentage of Meat Meal in the Ration on the Keeping Quality of Eggs in Cold Storage.

For this experiment 60 White Leghorn pullets were selected from a flock of 800, average quality laying pullets being chosen. They were divided into pens of 10 (an equal number of each strain being placed in each pen), and housed in standard breeding pens (house and attached yard) fitted with trap nests. Three pens of 10 birds were used as controls and three pens of 10 received the high meat meal ration. Birds were fed wet mash in the morning, approximately 1½ ozs. green feed (chaffed lucerne, berseem or barley) per bird at mid-day and wheat in hoppers. The constituents of the mashes were:—

Control Group—
- Pollard, 60 lb.
- Bran, 33½ lb.
- Meat meal, 6½ lb.
- Salt, 22 ozs.

High Meat Meal Group—
- Pollard, 56 lb.
- Bran, 32 lb.
- Meat meal, 12 lb.
- Salt, 22 ozs.

Shell grit was available to all birds.

Eggs were marked as collected from the trap nests, stored under normal farm conditions and forwarded without washing twice a week by rail to the Egg Marketing

Board. They were then candled and eggs of export quality (dirt not being a disqualification) were placed, without washing, in cold storage. After 8-9 weeks in cold storage the eggs were taken out, candled, repacked and left at room temperature for three weeks and again candled. All eggs candled at this stage were broken and classified, and this classification was used in assessing the final results.

The experiment was continued for 23 months and the results are set out below in two sections—first period of 12 months and second period of 11 months.

Candling Results Prior to Storage.

During the candling of the eggs upon arrival at the Board floor, any defects such as blood spots, thin or porous shells and enlarged ruptured or tremulous air cells were noted for each egg. When the results were analysed it was found that there was no significant difference between the eggs produced by the two groups.

Egg Production.

This was exceedingly variable from bird to bird and in order to gain an idea of the effect of ration on egg production it was necessary to discard all birds which died during the period and also all birds which laid 90 eggs or less in the year.

Table Showing Egg Production in Each Group.

	6·5 Per cent. Meat Meal.			12 Per cent. Meat Meal.		
	Pen 1.	Pen 2.	Pen 3.	Pen 4.	Pen 5.	Pen 6.
First Period (12 months).						
Total of eggs per pen ...	1,272	1,297	1,625	1,846	1,296	1,198
Number of birds ...	7	7	8	10	7	6
Mean Production for treatment ...	190·6			188·7		
Second Period (11 months).						
Total eggs per pen...	729	474	992	814	363	723
Number of birds ...	5	4	7	7	4	5
Mean Production for each treatment ...	137·2			118·8		

The differences in egg production are not significant, *i.e.*, they are not greater than could occur by chance.

Keeping Quality.

The keeping quality results for eggs three weeks ex cold store are set out below. The incidence of rots was low and the differences non-significant. The small number of rots was probably due to production of relatively clean eggs, and non-washing of eggs before storage.

Table Showing Storage Rots (3 weeks ex cold store).

	6·5 Per cent. Meat Meal.		12 Per cent. Meat Meal.	
	1943-44.	1944-45.	1943-44.	1944-45.
Number of Eggs Stored ...	3,747	2,900	3,723	3,160
Number of Eggs Rotted...	57	38	49	16
Per cent. Rotted... ...	1·52	1·31	1·32	0·51

Conclusion.

In this experiment a high percentage of meat meal (12 per cent. in the mash) failed to produce any harmful effect on the keeping quality of eggs in cold storage.

2.—Effect on Egg Production of Increasing Meat Meal in Summer and Autumn.

Birds in this experiment were White Leghorn pullets selected in the same manner, at the same time and from the same flock as those in Experiment 1. Thirty pullets were housed in groups of 10 and the control groups of Experiment 1 served as controls in this experiment.

The control group was fed as in Experiment 1 and the experiment group received the following mash:—

May 1st-November 30th—
Pollard, 60 lb.
Bran, 33½ lb.
Meat Meal, 6½ lb.
Salt, 22 ozs.

December 1st-April 30th—
Pollard, 60 lb.
Bran, 30 lb.
Meat Meal, 10 lb.
Salt, 22 ozs.

Greenfeed, grain and shell-grit as for controls.

Egg Production.

As in Experiment 1, egg production showed a wide variation, and all birds laying 90 eggs or less during the year were discarded.

Table Showing Egg Production in Each Group.

	6·5 Per cent. Meat Meal.			6·5 — 10 Per cent. Meat Meal.		
	Pen 1.	Pen 2.	Pen 3.	Pen 7.	Pen 8.	Pen 9.
	First Period (12 *months*).					
Total eggs per pen...	1,272	1,297	1,625	834	890	1,275
Number of birds ...	7	7	8	4	5	8
Mean Production for each treatment ...	190·6			176·4		
	Second Period (11 *months*).					
Total eggs per pen...	729	474	992	551	361	270
Number of birds ...	5	4	7	4	3	3
Mean Production for each treatment ...	137·2			118·2		

The differences in egg production for both first and second periods are not significant, *i.e.*, they are not greater than could occur by chance.

Conclusion.

In this experiment increasing the meat meal from 6½ per cent. to 10 per cent. in the mash during the summer and autumn failed to give increased production.

Acknowledgments.

The handling and examination of eggs at the Egg Marketing Board were supervised by Messrs. Haynes and Meade and statistical analyses of results were carried out by Mr. F. McCleery, Biometrician, Department of Agriculture.

Benzene Hexachloride (Gamma Isomer) as a Preventive of Poll Strike in Rams.

IT has been previously reported, in the October 1946 issue of this *Gazette*, that wool taken from the crutch area of ewes, which had been jetted five weeks previously with 0.5 per cent. xylol-benzene hexachloride mixture (13 per cent. gamma isomer), was toxic to larvae of *Lucilia cuprina* The results from these trials suggested that benzene hexachloride should be tested as a strike preventive.

An aspect of the blowfly problem which has not received much attention is the prevention of poll strike in rams. In this brief statement an outline is given of two experiments in which benzene hexachloride has been used for the prevention of poll strike.

Thirty Merino rams, shorn February, 1946, on Wright Bros.' Bickham Stud, Blandford, were jetted on 5th November, 1946, with an 0.75 per cent. benzene hexachloride-xylol emulsion. The emulsion was applied to the rams' heads with a stirrup pump at the rate of ½ gallon per ram. The adverse season in late 1946 was unfavourable for fly activity. However, whilst no poll strikes were recorded in the treated rams within ten weeks, approximately 15 per cent. head strikes was obtained in the untreated rams.

The polls of seventy-five Merino rams, shown August, 1946, were treated with a similar concentration of benzene hexachloride at Trangie Experiment Farm on 12th and 13th March, 1947, at the rate of ½ gallon per ram. A control group of 200 untreated rams was kept under observation. The treated rams were free of poll strikes for eight weeks, but during this period there were fifty strikes in the control group. Under the conditions of this trial, benzene hexachloride prevented poll strike. The experiment is being continued.

In treating the rams the wool on the poll area was saturated with the emulsion, which had no apparent adverse effect on either the rams or wool. The benzene hexachloride, which was used in these investigations, had a 13 per cent. gamma isomer content.—G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

Imported Pedigree Poultry and Goats To Come Under Subsidy Scheme.

THE Australian Agricultural Council has agreed to extend the subsidy scheme to assist importers of pedigreed stock to include importation of birds and settings of eggs for hatching from Great Britain, Northern Ireland and Eire, and also Anglo-Nubian and British Alpine breeds of milch goats. The scheme already covers Saanen and Toggenburg breeds.

Details of the scheme, as it applies to poultry, are given in Poultry Notes in this issue. In the case of Anglo-Nubian and British Alpine breeds of milch goats, it should be noted that until these new breeds are established in Australia only the importation of bucks and does of the same breed in one consignment will be subsidised.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingah.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingah State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J R., " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	55
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., " Elwatan," Castle Hill (Jerseys) ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	167
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., " Meryla," Culcairn	65
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., " Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	95
Martin Bros., " Narooma," Urana-road, Wagga (Jerseys)	127
New England Experiment Farm, Glen Innes (Jerseys)...	49
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, W. R., Calool, Culcairn	80
Reid, D. B., " Evandale," Sutton Forrest (Aberdeen-Angus)	24
Reid, G. T., " Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H. " Turanville," Scone (Polled Beef Shorthorns)	114
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	9
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., " Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Yanco Agricultural High School	64
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale ...	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
New England University College, Armidale	20
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62

MAX HENRY, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	40	13/4/47
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixson, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	107	11/4/47
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Llmond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	[illegible]	14/9/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	86	12/2/47
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station	19	29/4/47
Weatherlake, J., "Bransome," Camden ...	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus	300	20/4/47
Wollongbar Experiment Farm (Guernseys) ...	119	20/4/48
Yanco Agricultural High School, Yanco ...	71	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48

Owner and Address.	Number Tested.	Expiry Date.
Australian Missionary College, Cooranbong ...	100	30/8/47
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	33	20/2/47
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	23	29/4/47
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/[illegible]/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
Marist Bros. College, Campbelltown	70	3/1/48
McGufficke, J. O., "Lovely Bank," Rob Roy, Inverell	33	25/6/47
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	25	18/4/49
O'Brien, O. "Mount View," Inverell .	18	9/2/47
Orange Mental Hospital	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	10	15/11/46
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	85	20/3/47
Weatherlake, J., "Bransome," Camden ...	7	14/3/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	54	10/6/47
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

MAX HENRY, Chief of Division of Animal Industry.

Distemper in Dogs - Value of Immunisation.

DISTEMPER is an infectious disease caused by a virus—an organism so small that it cannot be seen by the ordinary microscope. It is usually contracted through contact with infected dogs, dingoes and infected kennels.

At the outset, the symptoms are difficult to recognise. There is a slight dullness, and the dog is not as eager as usual for his feed. After a day or so, he becomes sore in the eyes and a discharge appears. By this time the animal is quite dull, lies about a good deal, and may refuse food entirely.

At this stage treatment of the animal is relatively simple, but it quickly becomes difficult and perhaps hopeless as the animal contracts the many complications associated with the disease. Weakened in resistance, it may contract bronchitis, pneumonia, bowel trouble, ear and nervous complications, which in the majority of cases cause heavy mortality. Even though one attack of distemper provides a dog with a life-long immunity, often they are left with permanent disabilities such as general weakness or nervous fits.

These complications can be prevented by the modern technique of immunisation, and therefore anyone who breeds valuable dogs is well advised to have them immunised when they are about three months old.

This immunisation is done by giving the dog a fixed dose of the live distemper virus, and then controlling its effect by anti-distemper serum, thus building up the immunity and resistance of the animal without endangering it to the harmful effects which usually follow natural attacks. Immunity built up in this manner will, in nearly every case, last for the lifetime of the animal.

You may ask why not allow the young animal to catch distemper naturally and then treat it in the early stages. There would always be the risk that the animal might be very susceptible, and as the dose of the infective virus would be unknown, the veterinarian would be handicapped in the treatment of the animal.

It is pointed out that there is some degree of risk in immunisation, and therefore it should be left to your veterinary practitioner to carry it out, as he is the person equipped with the necessary knowledge.—J. N. HENRY, Acting District Veterinary Officer.

Milk from the Home Cow.

Safeguard of Tuberculin Test.

"I HAVE recently purchased a cow to provide milk for my family. As I have two young children, I am particularly anxious to know that the milk from this animal should be free from T.B. I understand tests can be made of the milk. Can I arrange to have this done, and who would do it?"

Replying to the above question from a young farmer, an officer of the Division of Animal Industry of the Department of Agriculture advised:

"Your question is a common one, and first of all it is pointed out that testing of the milk will not serve your purpose. Although T.B. germs are passed in the milk they are not always present; in other words, a cow may be infected with T.B. and may not necessarily be passing T.B. germs in the milk at the time when a test is made.

"There is only one way by which you can be certain that your cow is free from infection, and this is by arranging to have the animal tested with the tuberculin test. This test is specific for the disease and very reliable. You should contact your nearest practising veterinary surgeon with a view to arranging such a test, a registered veterinary surgeon being the only person who may carry out the test."

A TOTAL of 2,176 acres of potatoes, comprising 1,830 acres of Factor, 232 acres Katahdin, 52 acres Sebago, and 40 acres of other varieties, were certified this year, reports the Division of Plant Industry of the Department of Agriculture.

THE AGRICULTURAL GAZETTE FOR JULY, 1947.

This Issue Contains:—

Editorial—

Agricultural Research.

MONEY spent on agricultural research is a wise investment; too often it is regarded as a straight-out expense. Improved financial returns obtained by farmers whose methods are based on the results of successful research far outweigh the cost of that research. In addition, this improvement in farm returns, as a direct result of applied research, is a continuing one.

The weighing of returns against outlay on research in this country has hardly been attempted. Such statistics would supply the most convincing argument to prevent a tendency to prune research estimates, and this is pruning time for estimates.

We are content, generally, to let the results of applied research speak for themselves. They are convincing, but not nearly so convincing as when reduced to £ s. d.

Last year U.S.A. Federal and State Agricultural Institutions spent something over $27,000,000 on research projects. That is the outlay; here are a few of the dividends.

Research in Texas saved farmers $30,000,000 last year by giving them root rot resistant sorghums.

New oat varieties in Indiana, because of bigger yields and better quality, increased growers' returns by $5,000,000. That was in one State alone.

A new wheat, Sandford, gave Georgia growers an extra $400,000.

Research in Florida has popularised citrus pulp as a cattle feed, and, incidentally, has helped canners in that State to dispose of cannery wastes. The total annual value of this one-time "waste" is now $2,250,000.

Those few examples alone give a substantial balance over the outlay of $27,000,000. U.S.A. Office of Experiment Stations records thousands of other successful research achievements. For example, new resistant wheats have been developed for the Plains States, cherries for West Virginia, better-yielding hybrid maize for irrigated lands, long-season pastures for Missouri, and freeze-resistant apple trees to push the fruit belt farther north.

South Dakota and Kansas stations bred improved varieties of oats, wheat, and maize. Research institutions in the Ohio Valley increased the value of soybeans for oil, beans, and meal, and worked out better insect-control programmes to lighten losses previously suffered by pear-growers in Oregon, lucerne seed growers in Utah, sweet corn growers in New Jersey, onion

planters in Idaho, and citrus growers in California.

Those are still but a few of the direct results of agricultural research. Sufficient, however, to suggest the wisdom of investing money in research, both from the point of view of individual and State prosperity and stability.

Linseed Oil Supplies.

1949 Harvest Should Meet Requirements.

GIVEN favourable conditions, there should be a small quantity of Australian-grown linseed available for crushing for the production of linseed oil at the end of next season, and the 1949 harvest should meet practically all requirements.

In making this statement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), said that commercial production of linseed in Australia had become possible entirely as a result of his Department introducing a variety suited to local conditions. All previous attempts had failed because unsuitable varieties were used.

Mr. Graham said his Department had in 1936, introduced the variety "Walsh," which was eminently suited to local conditions. When in 1944. it was anticipated that a large quantity of seed would be required for planting, a start was made to increase substantially stocks of the variety.

"In 1945," said Mr. Graham, "the Commonwealth Government, at the instigation of New South Wales, guaranteed growers £34 per ton for all Walsh linseed produced, but the guarantee was not renewed in the following season. However, all suitable Walsh seed from the 1945 crop was stored by the Department of Agriculture.

"All this seed was acquired this season by local linseed oil manufacturers after consultation with officers of the Department of Agriculture, and was distributed between New South Wales, Queensland, Victoria and Tasmania to reduce the risk of loss through drought. The seed has been placed with reliable growers in selected districts, who have been guaranteed £40 per ton at sidings or world parity, whichever is the higher at harvest time."

Mr. Graham stated that approximately 30 tons of seed had been distributed and a total area of some 2,500 acres sown, mostly in New South Wales. It would be necessary to retain the seed from the entire resulting crop for re-sowing in order to secure the quantity necessary to plant an area which would meet local requirements of oil and, on present indications and given favourable conditions, it should be possible from the 1949 harvest to meet practically the whole of our requirements.

"The present determined effort," said Mr. Graham, "to produce all local requirements of linseed oil has been made possible entirely as a result of fundamental investigations which we have undertaken. In addition, we have explored the possibilities of producing other vegetable oils which could replace linseed oil, particularly tung and safflower, and action to develop these is being undertaken."

Importation of Poultry from United Kingdom Prohibited.

Defence Against Fowl Pest.

THE attention of poultry farmers and other interested persons is directed to the fact that under the provisions of a recent proclamation made under the Quarantine Act the importation of poultry, pigeons, aviary birds and eggs for hatching from the United Kingdom is now prohibited.

The effect of this measure is that such importations may now be made only from New Zealand.

Drawing attention to this proclamation the Chief of the Division of Animal Industry who is also Chief Quarantine Officer (Animal) for New South Wales, stated:—

"Previously under the Quarantine Act, 1908-24, eggs and poultry were permitted to be introduced from certain countries provided they complied with regulations under the Act. The countries from which importations were permitted included Great Britain, Northern Ireland and Eire, but information now to hand indicates that extensive outbreaks of fowl pest have occurred in Great Britain, and as this disease does not occur in Australia every effort is being taken to prevent its introduction. It is for this purpose that the action indicated has been taken by the Commonwealth Minister for Health, Senator McKenna.

"As fowl pest is a highly infectious and fatal virus disease of poultry and birds its introduction would be a severe blow to the poultry industry of this country. Australia had experience of a variety of this disease in 1930-32, when Newcastle disease appeared in Victoria. The Victorian Department of Agriculture in this case adopted radical measures and were successful in eradicating the disease."

The Way to—

BETTER PASTURES IN THE CENTRAL WEST.

B. D. AMENT, H.D.A., Agrostologist.

IT is more important now than at any previous time that we should realise that pasture is our most important crop—not only because of the primary products derived from it, but also because of its effect on the growing of other crops, on soil fertility and on soil erosion.

Pasture improvement was only slowly adopted at first in the central west, but is now much more generally practised. Quite a number of properties on the Central Tablelands are extensively sown with Subterranean Clover and have considerable areas on which mixed pastures have been established. However, the work is still in the initial stages and there is greater need for its extension as each season passes.

In this article, the author discusses the factors which have influenced the spread of the practice of pasture improvement in the central west, and describes the most modern methods now in use. The information given will be of value to farmers and graziers of the Central Tablelands and Slopes, and much of it will be of interest outside those areas.

Early History of Pasture Improvement.

The natural pastures of New South Wales are reputed to have been fairly good when the white man first settled here, and while land was plentiful and more or less to be had for the asking most of the earliest settlers were quite content with the pastures as they found them. Little pasture improvement was attempted, or even considered, except for the more or less indiscriminate destruction of timber to allow native pasture plants to grow.

Nevertheless, it is apparent that a few of the earlier settlers did make some attempt to improve the pastures by the introduction of species from other countries, usually the British Isles. As evidence of this we find that in many districts more favoured climatically, species such as Perennial Rye, Kentucky Blue, Cocksfoot, and other grasses, and clovers including White, Strawberry, etc., have become established and are now part of the recognised pasture flora. On favoured spots they have

Ewe Hoggets on a Perennial Rye-Subterranean Clover Pasture in the Orange District.

become the dominant species to the partial or complete exclusion of native plants.

Medics and clovers introduced accidentally or by design have become established over a large part of the State, and contribute a considerable percentage of the fodder provided by pastures for the greater part of the year. Most people now incorrectly regard these species as native, as they have become so widespread.

With the gradual diminution of soil fertility and the deterioration of our natural pastures through heavy and continuous grazing by sheep and rabbits, it was realised that some attempt to improve our pastures was not only warranted but essential, if production was to be maintained.

Start of the "Pasture Improvement Era."

In the early days, crop land thrown out of cultivation for a period would revert to natural pasture of some value. As years went on it was found that valuable natural pasture plants did not re-appear so readily, and that useless weeds replaced them. Soil erosion also began to take its toll of our soils. The far-seeing members of our farming community could visualise the time not far distant when much of our land would become unproductive, as has happened in other and older countries.

It was that section of the community which inaugurated what might be called a "pasture improvement era" into our agriculture. For the most part these men were regarded as optimists, but they certainly performed a national service by their foresight and perseverance. By trial and error, very often costly to themselves, these men developed satisfactory methods of improvement and unsuitable species were eliminated.

In the Central Tableland and Central Western Slopes areas it is more than a quarter of a century since the pioneers and advocates of pasture improvement first began extolling the benefits of the various methods and of the value or otherwise of the array of pasture plants available. In those days not very much was known of the behaviour of these plants individually or collectively under our varying conditions of soil and climate. Quite formidable mixtures of seed of all or most of the available species were usually sown, based sometimes on experience in other countries, but usually on the "hit or miss" principle; that is, a large number of species was sown with the hope that some, at least, would persist. In this way these mixtures became known as "shot gun" mixtures; they were both expensive and included many unsuitable species.

The result was that following germination the young plants were overcrowded. Many were unable to survive this competition, particularly during the first dry spell, and mortality was heavy. The survivors were not always those plants most suited to the conditions, rapid early growth having enabled them to become established at the expense of others. The resultant pasture was comparatively sparse and unsatisfactory. Occasionally the surviving plants were those most suited to the conditions and a satisfactory pasture developed and persisted.

Satisfactory Simple Mixtures Determined.

Through investigations conducted by officers of the Department of Agriculture, and trial and error methods by many landholders, the unsuitable species have been eliminated, and very simple and comparatively inexpensive mixtures of seed evolved, usually containing not more than two or three species. The behaviour of each of the species in competition with each other has been studied, so that species such as the Rye grasses, which grow comparatively quickly, are not recommended to be sown in the same mixture as *Phalaris tuberosa*, which grows slowly at first and is allergic to the competition of other grasses. Cocksfoot was fairly generally sown until recent years but has now been abandoned, except in isolated cases.

The most notable development during the last twenty years has been the extensive use of Subterranean clover in the Central Tableland and more favoured parts of the Central Western Slopes. It has come to be the basis of all pasture improvement work where it will grow satisfactorily, just as lucerne is the basic plant for the drier areas of the slopes and for the nearer plains.

The main benefits of improvement of pastures may be discussed under the heading of soil fertility maintenance, soil erosion control, influence on carrying capacity and weed control.

The Benefits of Pasture Improvement.

Soil Fertility.—Loss of soil fertility, particularly on the older cultivation areas, has become more apparent and more serious in recent years, indicating the necessity for diversified farming and the introduction of rotations. Included in any such rotation must be a period when the land is under pasture—a pasture designed not only to provide grazing for stock, but chiefly to maintain and increase fertility. World-wide authorities appear to be unanimous that a suitable pasture, well managed and grazed intelligently, does more for soil fertility than any other factor.

In most of the older and more closely settled countries of the world, diversified farming and rotation of crops have been practised for many years. No organic matter is wasted; it is returned to the land—and even brought in from outside sources where available. Comparatively little use has been made of this system in this country because of the scarcity of suitable materials, the larger areas, and probably because most farmers have regarded it as unnecessary in the past.

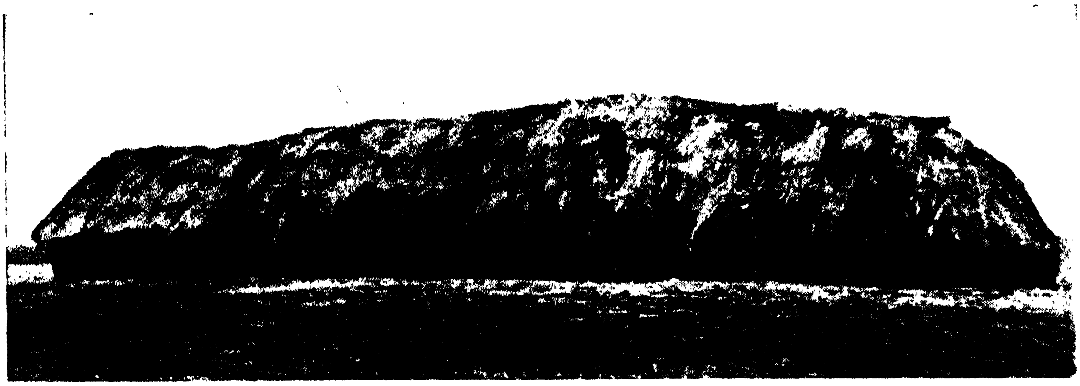
One-crop farming must give way to a type of farming using suitable rotations if soil fertility is to be maintained, and where this has been done its value has been amply demonstrated.

Soil Erosion.—While mechanical means, such as contour banking of cultivation land, and various methods of handling gully erosion, when efficiently designed and maintained, have proved very valuable in slowing the erosion process and even reclaiming badly eroded areas, they do not provide a complete cure for the underlying cause of erosion—the destruction of surface cover and organic matter in the surface soil.

There is considerable difference of opinion on the efficacy of trees in preventing soil erosion. While it is conceded that virgin forest or bushland provides very adequate control by reason of the soil cover of twigs, leaves and bark, forest or bushland disturbed by the grazing animal may provide little or no control. There are many instances today of areas such as stock routes reserves, etc., where, though green timber is comparatively dense, serious erosion has occurred because the soil cover has been removed by overstocking.

Rabbits have contributed considerably to the overstocking and removal of surface cover, and while they have added to our national income they have caused immeasurable loss, not only by robbing sheep and cattle of pasturage, destruction of crops and the cost of their control, netting fences, etc., but also by damaging, sometimes irreparably, our greatest asset—the surface soil.

The provision of a more or less permanent surface cover with the addition of organic matter to the soil, by means of a suitable pasture, is the only permanent answer to the soil erosion problem, as it removes the cause. Today there are many examples of land which has been reclaimed by pasture improvement—land which at one time was eroding badly and on which surface tanks silted up, but which now only shows indistinct traces of the former havoc and on which the runoff is now so small that special additional provision must be made to supply water for stock.



A Thatched Stack of Subterranean Clover in the Orange District.

Carrying Capacity.—It is safe to say that pasture improvement will increase the capacity of the land to carry stock. The extent of the increase will, of course, depend on many factors, such as climate, soil type, type of pasture improvement carried out, the state of the pasture before improvement, and the general management.

Improved pastures should enable the land to carry the same number of stock much better, or an increased number of stock as well, or to maintain a greater number of stock in better condition. In many cases they enable a change in the type of animal husbandry to be made; for instance, country has been changed from dry sheep, wool growing country to breeding, fat lamb raising and good fattening country.

Many landholders make the mistake of expecting too much too soon, tending to overstock thus not giving the improved pastures a chance. It is always good policy to wait till the feed is there on the farm, either growing in the paddock or conserved, before acquiring the stock to eat it.

Weed Control.—Vigorous, dense, well-managed pastures provide almost complete control of practically all the noxious and undesirable weeds to be found on the Central Tableland and Central Western Slopes. Often the main difficulty in this method of weed control is to establish a suitable pasture in competition with a dense population of some of the vigorous weeds, but usually careful attention to the preparation of the land, with the use of one or two cleaning crops, plus a period of worked fallow, will suppress the weed sufficiently to enable satisfactory establishment of the pasture to be achieved.

St. John's wort, serrated tussock and bracken fern, three of the worst Tableland weeds, have been reduced in density by the use of Subterranean clover, as also have all the thistles. On the slopes lucerne has proved efficient in controlling thistles, black oats, skeleton weed and Bathurst burr.

A weed which has recently caused some concern in isolated sections of the tablelands is wild bugloss (*Lycopsis arvensis*) which competes with Subterranean clover. However, cultivation will control this weed, and mowing in the spring before seed is set may assist in its eradication in pasture land.

Control the Rabbit First.

Before attemptng any other form of pasture improvement it is essential that the rabbits be eradicated or brought under control. On pasture land where rabbits are numerous the eradication of these noxious animals produces a very valuable and usually a very marked improvement in the pastures. It has not been uncommon for tableland country to be carrying the equivalent in rabbits of two or three sheep per acre, and still be expected to carry a normal compliment of sheep. It is not much use, from the stock angle, carrying out other forms of pasture improvement to feed rabbits. They are not only gross eaters, but are also selective feeders, eating out the more valuable species by continued close cropping—much closer than possible by other animals.

TYPES OF IMPROVEMENT.

Natural Pastures.

Our natural pastures provide most of the grazing for sheep and cattle, and a number of the native grasses such as Wallaby and Spear are well adapted to our climatic and soil conditions, and are relatively drought resistant, palatable and nutritious. It is imperative, therefore, that everything possible should be done to maintain, or even increase, .the percentage of these valuable native plants in our pastures.

Sheep are notoriously selective feeders—that is, they concentrate on the more palatable plants, and particularly when country is overstocked, tend to eat them out altogether, before grazing on the less valuable ones. The pastures tend then to be dominated by poor, unpalatable species, and production suffers.

Management of natural pastures should be designed to encourage the growth and seed production of the better species, and so raise the production and feed value of these pastures. Rotational grazing, removal of stock before they damage the better type grasses, even though the stock are not losing condition, and periodic spelling to allow recovery of the more palatable species, do much to assist in this direction, but have little effect on soil fertility.

Topdressing.—The most practicable method of maintaining or improving soil fertility and increasing production is by topdressing the pastures with artificial

fertilisers, making conditions more favourable for growth of the valuable species and increasing the palatability of the less valuable species so that they are more readily eaten by stock and kept under control.

As most of our soils are deficient in available phosphates, the use of superphosphate as a topdressing for natural pastures has in the past given good results. The phosphate stimulates firstly the growth and density of the legumes (clovers or trefoils), and, secondly, the growth of the more valuable grasses such as species of *Danthonia* (White Top or Wallaby), *Stipa* (Spear), *Agropyron* (Wheat grasses) and *Poa bulbosa*, making them more palatable and nutritious.

Annual dressings of up to 1 cwt. of superphosphate per acre have produced as much as a 100 per cent. increase in carrying capacity.

On the Central Tablelands and parts of the Slopes where Subterranean clover grows well, this method has largely given way to the method described later in this article for non-arable land. However, on those parts of the Slopes where it is too hot and dry for this clover, this method is still recommended, but the applications should not exceed 1 cwt. per acre every second year. The best time for topdressing is the autumn—March or April. This gives some stimulus to growth before the winter sets in.

Those contemplating this type of improvement should not be discouraged by lack of immediate and remarkable visible results, particularly where there is a deficiency of legumes. It may take a year or two for these legumes to multiply and make an appreciable contribution to the pasture. Again, stock tend to concentrate on topdressed areas and eat them down so that they do not appear to be any better and may even look worse than areas not topdressed.

(*To be continued.*)

Approved Vegetable Seed—July, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Cauliflower—continued.

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Winter Control of Wild Onion.

Now is the best time of the year to dig out wild onion or scented garlic (*Nothoscordum fragrans*), often mistakenly called onion weed. This long and flat-leaved liliaceous plant, which has small white flowers, is a common pest of garden areas in many parts of the County of Cumberland and other high rainfall areas of New South Wales.

No weed killer is sufficiently effective to use as a spray for the purpose of destroying the bulbs of the plant. Some arsenical weedicides will kill off the top growth, but they do not affect the bulbs.

By digging up or forking out this weed, during the period June-September, most of the old and young bulbs can be lifted out of the ground, as they remain attached to the plant. However, if this work is delayed until after that period, all of the young bulbs will break off when the plants are moved and so remain in the ground.

Where wild onion occurs in lawns, the growth of the grass should be invigorated by the use of fertilisers and adequate watering, necessitating frequent mowing, which will gradually kill out the weed.—WEEDS OFFICER.

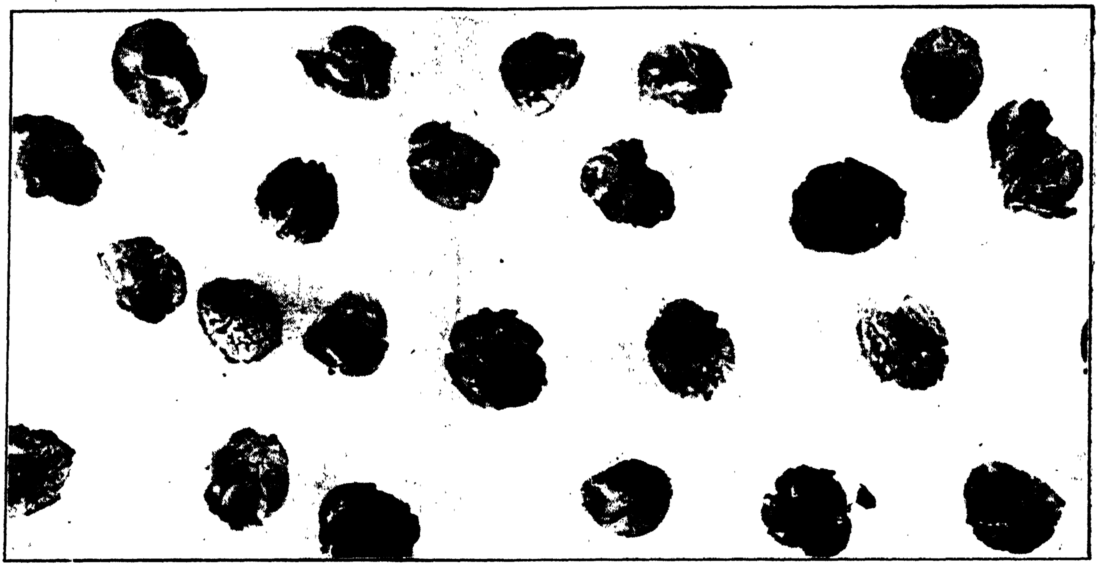


Fig. 1.—Paspalum Ergots (Magnified 3½ times.)

ERGOT IN PASPALUM.

CONTRIBUTED BY BIOLOGICAL BRANCH.

ERGOT is the common name given to a number of parasitic fungi which infect the flowers of grasses. The parasite invades the growing seed, producing in its stead, a structure which is called an ergot. The ergots are more or less cylindrical, dark violet, and several times as long as the grain of the grass or cereal in which they occur (Fig. 3).

Several species or ergot fungi are known to occur in New South Wales, the best known being the paspalum ergot and the ergot of rye. Paspalum ergot appeared first in New South Wales in epidemic form in December, 1935, and has reappeared regularly every summer since then. The disease has created a nuisance in urban districts where paspalum is a common weed of parks and playgrounds and of lawns adjoining footpaths. Unless the seed heads are kept closely mown, the sticky secretion fouls stockings and other clothing of users of these areas.

Experience in all countries in which the disease has occurred has indicated that the "honey dew" phase is harmless to stock, but ill effects may follow when stock are retained on areas containing large numbers of mature ergots. Sickness due to ergot ingestion is sufficiently common that stockowners should become conversant with it.

Rye ergot may affect a variety of cereals and grasses, exclusive of paspalum, but it is not common in this State. There is a commercial demand for rye ergots because of the medicinal drugs which can be extracted from them and they are specially cultivated in some parts of the world.

The paspalum ergot fungus (*Claviceps paspali*) attacks only paspalum grasses. In this State it has been recorded from the common paspalum (*Paspalum dilatatum*), water couch (*paspalum distichum*), and *Paspalum urvillei*. The ergots which it produces are small and globular, hard and horny in texture, light greyish brown in colour and slightly roughened. (Figs. 1 and 2.)

Ergots are resting structures by means of which the fungus overwinters. When mature they fall to the ground where they remain until the advent of moist, warm conditions in late spring or early summer causes them to germinate. Each ergot produces one or more small white outgrowths, ⅛-½ inch in length, terminating in a swollen head about the size of a pin's head. Minute, needle-like spores are produced in sacks in these terminal heads, and when mature,

these are expelled into the air and drift on wind currents to young paspalum flowers which they infect. Evidence of infection is obvious within a few days. The tissues of the flower structure are destroyed and replaced by fungous threads, and there is a copious flow of a sugary solution known as

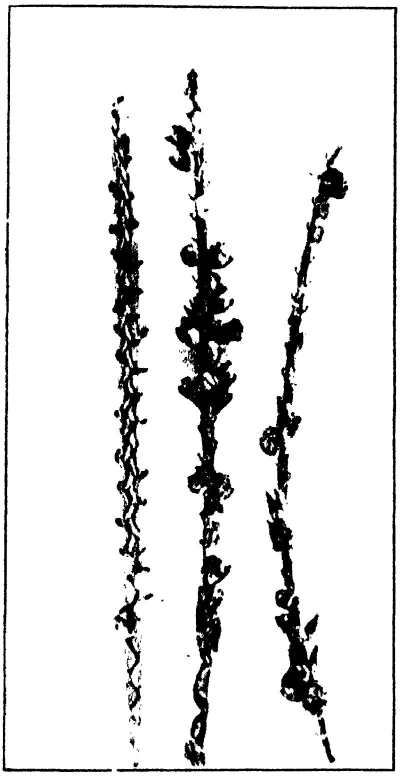


Fig. 2.
Left.—Young Healthy Head of Paspalum.
Right.—Two Heads of Paspalum Affected with Ergot.

"honey dew." This is responsible for the stickiness of the flower heads which is such a characteristic of this phase of the disease.

The honey dew contains countless summer spores of the ergot fungus, and the transfer of this by insects, grazing animals, etc., to other flowers results in the very rapid spread of the disease. Many generations of spores may be produced in this way in the course of a few months, new paspalum flower heads becoming infected as they develop throughout the summer.

Finally the honey dew production ceases and the ergot is formed.

Two fungous parasites may attack the ergot fungus at the honey dew stage. These produce their own fructifications over the infected heads and prevent the formation of the ergots. One of these (*Cerebella* sp.) forms a black wrinkled crust, and the other (*Fusarium* sp.) forms a smooth, bright salmon-red layer over the seed head.

The Animals Affected.*

Cattle seem to be most commonly affected, but cases have occurred in horses and sheep. Experiments have proved that all these animals are susceptible.

Symptoms.

These consist of irregular muscular twitchings throughout the body, indicated

Fig. 3.—Common Ergot.
Left.—Ergot on wheat.
Right Upper.—Ergots from wheat.
Right Lower.—Ergots from Tall Fescue Grass (*Festuca elatior*).

by shivering and jerky movements of the limbs and head. When walking, the gait is stilted and unsteady, and frequently animals fall. Excessive saliva may be seen dribbling from the mouth. Colic is frequently present and is shown by spasmodic attacks of pain.

* Supplied by Division of Animal Industry.

Scouring is not uncommonly seen. If driven, animals may stumble and fall and, while down, paddling movements of the limbs and sudden attacks of violent shivering may occur. Complete paralysis is also seen in some cases. In long-continued cases of repeated ingestion, dry gangrene of the extremities of the limbs, ears, etc., occurs owing to constriction of the blood vessels to the area. Finally, these portions slough off. The animals retain their appetite and will eat if food is taken to them.

The symptoms disappear if ergot is removed from the diet.

On post-mortem, there is distension of the meninges (the membranes enclosing the brain), with an accumulation of a large amount of clear fluid between the meninges and the brain.

Feeding Trials.

Ingestion of ergots does not cause abortion. The amount of ergotised paspalum necessary to produce symptoms has been determined by feeding trials at the Veterinary Research Station, Glenfield, when symptoms were produced in cattle which ate 2 lb. of paspalum heads containing 1.68 oz. of ergotised seeds over two days. Eight pounds of heads containing partially mature ergots produced symptoms in horses. No cumulative effect was produced when small quantities were fed over a time interval.

It has been found that cattle may readily develop an addiction for ergotised paspalum and that this will be eaten in preference to the normal paspalum.

Treatment.

Cattle may recover fairly rapidly if changed to a clean paddock. Recovery is assisted by drenching the affected animals with 1 lb. of Epsom salts in 1 quart of water to purge the animal of the poisonous substance. There is no evidence to show that any degree of immunity is developed after recovery from an attack, and recovered animals may, therefore, contract the condition again.

Farmers are advised, wherever practicable, to mow and burn diseased seed-heads, although it is realised that difficulties may be experienced in putting such a recommendation into effect.

Department of Agriculture Youth School at Young.
Conducted in co-operation with the Country Womens' Association and the Agricultural Bureau.

New Departmental Appointments.

Senior Technical Positions.

APPOINTMENTS to fill vacancies in several senior technical positions in the Department were announced during last month by Hon. E. H. Graham, M.L.A., Minister for Agriculture.

Chief, Division of Plant Industry.

Mr. W. H. Poggendorff has been appointed Chief of the Division of Plant Industry in the place of the late Mr. A. W. S. Moodie.

Mr. Poggendorff, who is 43 years of age, is a graduate in agricultural science and holder of diplomas in agriculture and dairying of Hawkesbury Agricultural College. He entered the Department of Agriculture as a scientific trainee in 1924, and following graduation as Bachelor of Science in Agriculture, with Honours, at Sydney University, he was appointed to the position of Plant Breeder at Leeton Experiment Farm in 1928. There he undertook breeding work on various crops, including, principally, rice and other cereals, linseed, and pasture plants under irrigation.

In 1940 he was appointed as Special Agricultural Instructor in the general culture of rice, linseed and other irrigation crops, as well as of oil and fibre plants, retaining control of the direction of breeding work on those crops. Early in the present year he was appointed Special Agronomist dealing with problems associated with irrigation farming and water supply on farms.

Mr. Poggendorff's work has taken him through many parts of the State and his services have been highly appreciated by primary producers and other members of the community with whom he has come into contact during the course of his departmental activities.

Acting Chief, Division of Marketing and Agricultural Economics.

Mr. C. J. King has been appointed Acting Chief, Division of Marketing and Agricultural Economics, in the place of Dr. H. J. Hynes, who was recently appointed to the position of Assistant Director of the Department.

Mr. King joined the Department as a scientific trainee eighteen years ago. He graduated as Bachelor of Veterinary Science in 1932 and obtained the degree of Bachelor of Arts five years later, after attending University lectures in this Faculty as an evening student. Subsequently he obtained the Diploma of Public Administration, and only recently he qualified for the degree of Master of Arts. He has taken a keen interest in marketing and economic probems, and the thesis submitted by him in connection with the M.A. degree dealt with problems of markets, prices, foodstuffs and agriculture.

In addition to his experience in the Animal Industry Division of the Department, Mr. King, after completing about two years' Army service, was made available to the Commonwealth Rationing Commission as Officer-in-charge of the N.S.W. Food Section, in which position his technical knowledge and administrative ability were of considerable value to the Food Control Administration.

Since resuming duty in the Department early in 1946, Mr. King has occupied the position of District Veterinary Officer at Armidale.

Chief, Division of Animal Industry.

Mr. Max Henry, Chief of the Division of Animal Industry and Chief Veterinary Surgeon, who retired on 30th June, is succeeded by Mr. W. L. Hindmarsh, Director of Veterinary Research at Glenfield Veterinary Research Station.

Mr. Hindmarsh's wide experience both in the field and in the laboratory in veterinary and stock husbandry work, together with his academic qualifications, give him a broad outlook on all aspects of the livestock industries.

Mr. Hindmarsh is a Bachelor of Veterinary Science (B.V.Sc.), Member of the

Royal College of Veterinary Surgeons (M.R.C.V.S.) and holder of Diploma of Veterinary Hygiene (D.V.H.). His M.R.C.V.S. and D.V.H. were obtained at Liverpool University Veterinary School, where he studied prior to return to Australia after serving in the first World War as a Regimental Veterinary Officer.

Mr. Hindmarsh was the first veterinary trainee in the Department to graduate at Sydney University. For a time, after graduation and until the outbreak of the 1914-18 war, he worked as a Walter and Eliza Hall Scholar.

For a time, after the last war, he was attached to the Department's headquarters veterinary staff, later being appointed District Veterinary Officer at Armidale. In 1928 he was appointed to Glenfield Veterinary Research Station, and subsequently succeeded Dr. Seddon as Director of Veterinary Research.

Research of particular interest to stockowners undertaken during Mr. Hindmarsh's directorship at Glenfield includes control of sheep blowfly, sheep feeding problems, brucellosis of cattle and pigs and toxaemic jaundice of sheep. He has also taken a very active part in establishing an artificial insemination centre at Glenfield.

For some years, Mr. Hindmarsh was examiner at Gatton Agricultural College in Queensland, and examiner in pathology and bacteriology at Sydney University Veterinary School, where for the last few years he has lectured in epizootiology. He is a member of the joint blowfly committee of the C.S.I.R. and Department of Agriculture, and is a member of the Stock Medicines Board under the Stock Foods and Medicines Act of New South Wales.

Chief Chemist.

Mr. A. V. Robinson has been appointed Chief Chemist in succession to Mr. E. Griffiths who recently retired from the position.

Mr. Robinson also joined the Department as a scientific trainee; he is a graduate in agricultural science and holder of Hawkesbury diplomas in agriculture and dairying. Since 1942 he has occupied the position of Senior Chemist, and during his twenty-five years of service with the Chemist's Branch has had experience in all types of agricultural chemical work, but in particular has been concerned with research into food problems. In collaboration with the Council for Scientific and Industrial Research, he conducted a two-year survey of citrus preservation technique and followed this with a two-year dairy products survey, again in collaboration with the Council for Scientific and Industrial Research. Mr. Robinson carried out much research upon the causes of, and the methods of prevention of "sandiness" and other defects of condensed milk.

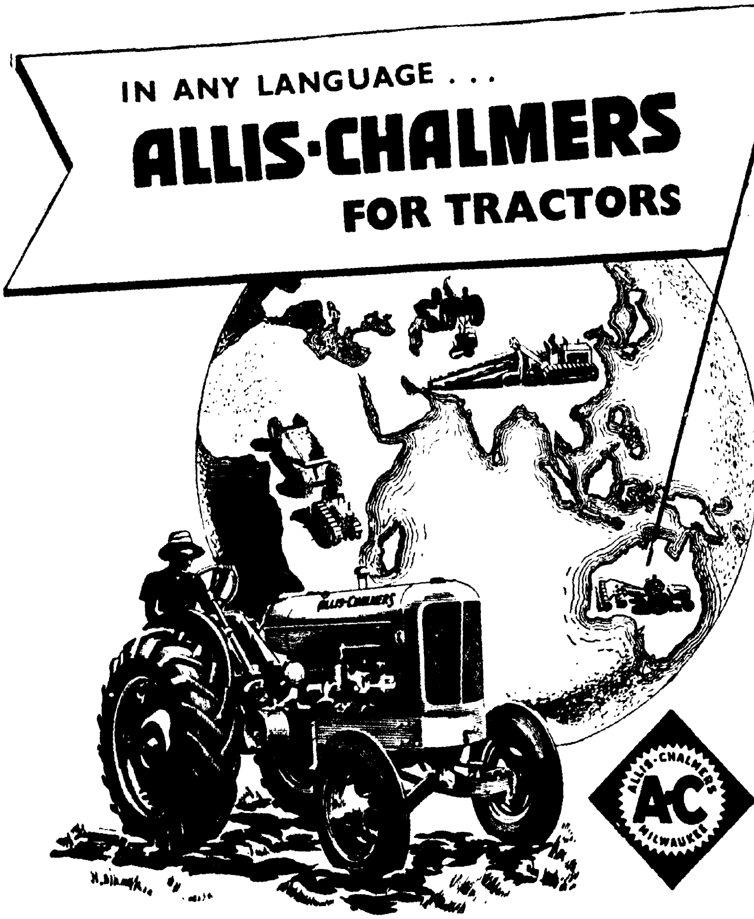
During the war years he gave courses of lectures in dairy technology to army food technology schools designed to train army personnel in the correct handling of army foodstuffs. He is particularly interested in laboratory design and has represented the Department on the Standards Association's committees on laboratory apparatus, fertiliser sampling and dairy products, for many years.

Deputy Chief, Division of Horticulture.

Mr. H. W. Broadfoot has been appointed to the newly-created position of Deputy-Chief of the Division of Horticulture.

Prior to joining the Department of Agriculture in 1920, Mr. Broadfoot was engaged in commercial fruit growing. Since his appointment to the Department, he has occupied positions as Fruit Inspector, Orchardist and Fruit Instructor. In 1927 he was appointed Pome Fruit Specialist and has been largely responsible for many improvements effected in recent years in the pome fruit industry. He became Chief Fruit Instructor in 1939.

In 1930 he was selected to go to the United Kingdom with a large shipment of apples, and to inquire into market possibilities for New South Wales pome fruits in the United Kingdom and on the Continent. He also made a specialised study of cold storage of fruit and his knowledge and reports on this subject have been widely sought by fruit growers in all parts of the State.


IN ANY LANGUAGE . . .
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FOR TRACTORS
AC

HAYMAKING

A Means of Conserving Fodder

That is Palatable and Nutritious.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

PERIODIC droughts present the greatest single menace to the livestock industries in Australia, and this makes the ever increasing fodder consciousness of the man on the land understandable. All practical farmers and agricultural workers realise that their efforts must be directed towards the conservation of still more and better fodder against inevitable drought periods, while with the greater present day knowledge of animal nutrition, the feeding of conserved fodder to supplement natural grazing is increasing deservedly in popularity, particularly in those districts producing milk and meat products.

In this article, which will continue for several issues, the place of hay in the fodder conservation programme is discussed, and details are given of the methods of growing, curing and storing suitable crops, and of the influence of these methods on the quality of the final product.

In the State of New South Wales, fodder is conserved in two forms. The first of these, conserved concentrated food, usually in the form of cereal grains, has recently achieved considerable popularity. Commonly the grain conserved is the oat, or maize grain, and until recently there has been a prejudice against the feeding of wheat grain. However, the 1944-45 drought demonstrated that the feeding of wheat is a practicable proposition. The second type of conserved fodder is preserved roughage, either hay or silage, which comprises plant material that has been subjected to a curing process, either by drying or by fermentation.

Advantages of Hay as a Stored Fodder.

To date, haymaking has held pride of place among these methods, and retains it, although the conservation of silage and grain as fodder reserves is increasing in popularity.

Cutting a Crop of Ford Wheat for Hay.
Estimated yield was 2 tons of prime fodder per acre.

There is still room for development in haymaking practices, particularly in the conservation of meadow hay in the better rainfall districts, and in good seasons generally. Hay has advantages when compared with silage as a source of conserved roughage in the ease with which it may be handled and its portability, coupled with the fact that hay is an article of commerce. Baled hay stored under cover will keep indefinitely, and small or large quantities may be added to or taken from the stack at will; to a less extent the same applies to sheaf or loose hay. More mature crops may be used for hay making; for example, when conditions such as frost injury preclude the setting of a payable grain crop, cereal crops may be used for haymaking, yielding a material which is very useful, especially when food is short. Under damp conditions when haymaking may be difficult or impossible, however, silage can frequently be successfully made, and material which would not make a palatable hay may make a palatable and nutritious silage.

Factors which affect Quality in Hay.

The object of haymaking is to cure the crop for storage, preserving intact as much of the nutriment of the growing crop as possible in a palatable form. Numerous cultivated crops can be used for hay making, and the principal ones will be enumerated. Advantage can also be taken of growth in good seasons to cure pasture hay. More generally crops are grown specially for hay, choosing the correct variety and cutting at the right time, in order to preserve a product of good nutrient value, colour, and aroma.

In choosing the correct time to cut, the requirements of high nutritive quality of the final product and of maximum yield per acre have to be taken into account, and to some extent these balance one against the other.

During the life of a plant, the distribution of foodstuffs through its leaves and stem varies. Young, actively-growing grass is high in protein content, and contains very little fibre compared with the mature plant. Protein is used by the animal for muscle (lean meat) building, and for the production of milk or eggs. The fibre content adds bulk to the ration, and a certain quantity of fibre assists digestion in the ruminant, but generally speaking, fibre itself is not very digestible and is of low nutritive value.

On a dry weight basis, young crops may compare very favourably in protein content with various concentrated meals such as peanut or linseed meal. This is particularly true of young legume growth, such as lucerne, which has a high protein content of a high nutritive value. In Europe, young grass up to nine inches high is cut, dried artificially by the application of heat, and is used for its protein and vitamin content. Such young grass could not be made effectively into hay by natural drying, because of its high water loss and the difficulty of handling it. Also it would be extremely subject to spoilage during curing, because of its very sappy nature, which would give rise to a "mushy" product. Under Australian conditions at present, the cost of drying grass artificially is prohibitive. Compared with European countries it is easier to keep young pastures growing through almost the whole year, while lucerne and other legume hays are available as sources of plant protein, so that the necessity for artificial drying does not arise.

In the young stage, the plant has a low fibre content and the nutrients—proteins, fat and carbohydrates—are distributed evenly through all parts. As seed is set and during the subsequent ripening of the seed, protein and starchy food material are withdrawn from the leaves and stems and concentrated in the seed. At the same time the fibre content of the plant increases, which, coupled with a decrease in the content of other materials, decreases the value of the stems and leaves for milk or meat production. Nevertheless, fibrous material—even wheat straw—can be utilised by stock as a source of energy for the maintenance of body activity, by which is meant little more than keeping alive.

In the making of hay, it is desirable that all parts of the product should be of comparable feeding value, and that all the nutriment should not be concentrated in one part, such as the seed, as the whole of the plant is to be eaten. In many cases, for instance with cereals, the seed may readily be lost in handling or through the depredations of mice or birds during storage.

Curing Hay.

In general the stage at which a crop should be cut for hay is shortly after flowering commences, for, if harvested in the early flowering stage, the crop yields the maximum amount of dry matter of high nutritive value. If cutting is delayed until the ripening of the seed has advanced, the digestibility of the product is reduced, and the proportion of woody materials increased at the expense of protein content. When a large quantity of hay is to be cut, and the whole crop cannot be cut at the same stage of maturity, it is generally advisable to commence cutting early, and to err on the side of cutting portion when a little immature, rather than a little after the correct time. It is difficult to make a general recommendation on this matter, however, and frequently weather conditions are the deciding factor, as young material is a little harder to dry. Much pasture hay is cut too late, and this may account to some extent for the prejudice of some farmers against this product.

About the only exception to the general rule, that is to cut at early flowering time, is the oat crop. It is cut when the first formed seeds, which are usually located at the top of the head, are in the late dough stage. One factor influencing this is the bitterness of the resultant hay if cut at the flowering stage, and the trade preference for a considerable quantity of grain in the sample.

The chief operation in making hay is the evaporation of the water present in the plant when it is cut. Normally the rate at which water is lost is slow enough to allow considerable changes in the plant during its removal. Although severed from its roots, the plant is still alive and respiring throughout the drying period, and during this process, foodstuffs in the plant cells are used up or changed in form. Rapid drying is most important to prevent losses of this kind, and the most rapid medium for the preliminary drying of the crop is in the swath where the crop falls when cut. However, when dried in this position, the leaves dry more rapidly than the stems, and mechanical losses may be increased, especially in the case of lucerne hay. The quality of hay is better when it has been dried in the windrow.

Heating in the Stack.

The curing of hay may continue in the stack for some days but the stacking of hay which is not thoroughly dry is attended by the risk of mould and fire. Loose hay should be teased out in building the stack, and every care taken to avoid the formation of pockets of entangled air in the mass. Overheating of the stack—besides the risk of fire—reduces the digestibility of the final product.

A Well-thatched Oaten Hay Stack at Temora Experiment Farm.
The stack is built on a straddle for protection against mice.

The Nutritive Value of Hay.

It is not easy to give a definite figure for the nutritive value of a hay of a certain kind, as it is subject to considerable variation according to the class of soil on which the plant is grown, fertiliser practice, weed content, weather conditions at harvesting time, and the efficiency of harvesting and stacking operations. In the case of meadow hay, the management of the pasture has a considerable effect on the final product. Early and careful spring grazing may reduce the competition of the more actively

growing constituents of the pasture with those of slower growth.

Vigorously growing plants give a more digestible hay with a low starch to protein ratio, but the yield of dry matter is much lower than from maturer growth. Early-cut hay produces a smaller quantity of material to be handled on a tonnage basis but gives a product with a high protein equivalent. However, it cannot compete where the gross yield of material is a prime consideration—for instance, for drought reserves for sheep—although the high protein material is very useful as a ration for animals used for milk or meat production.

In mixed hays, the presence of legumes is a considerable advantage, as the protein of lucerne, clovers, or trefoil is of high nutritive value.

Chaffing has little effect on the composition of hay and, with animals that bolt their food, may cause some loss of digestible material through insufficient mastication. Its advantages are that stock are made to eat the whole product and not merely pick at the more attractive portions, leaving a residue of the less attractive material. The general palatability of the sample is also increased. In addition, the bulk of the sample is reduced, making it easier to handle and increasing its salability.

Cereal Hay.

Compared with crops such as lucerne or pasture the making of cereal hays is a much more straightforward undertaking, and follows closely on the general principles set out above. Cereal hays are by far the most popular in New South Wales; in 1939-40, for instance, which was a fairly good season, of a total recorded production of approximately 1,050,000 tons of hay, 45 per cent. was oaten, 36 per cent. wheaten, 13 per cent. lucerne and 6 per cent. other hays, including meadow hay, barley hay and rye hay. Nearly 850,000 tons or 81 per cent. of cereal hay was harvested. Over a period, the average yield of cereal hay for the State is a little more than a ton to the acre. However, in more typical hay-cutting areas, cuts of two or three times this weight are not uncommon.

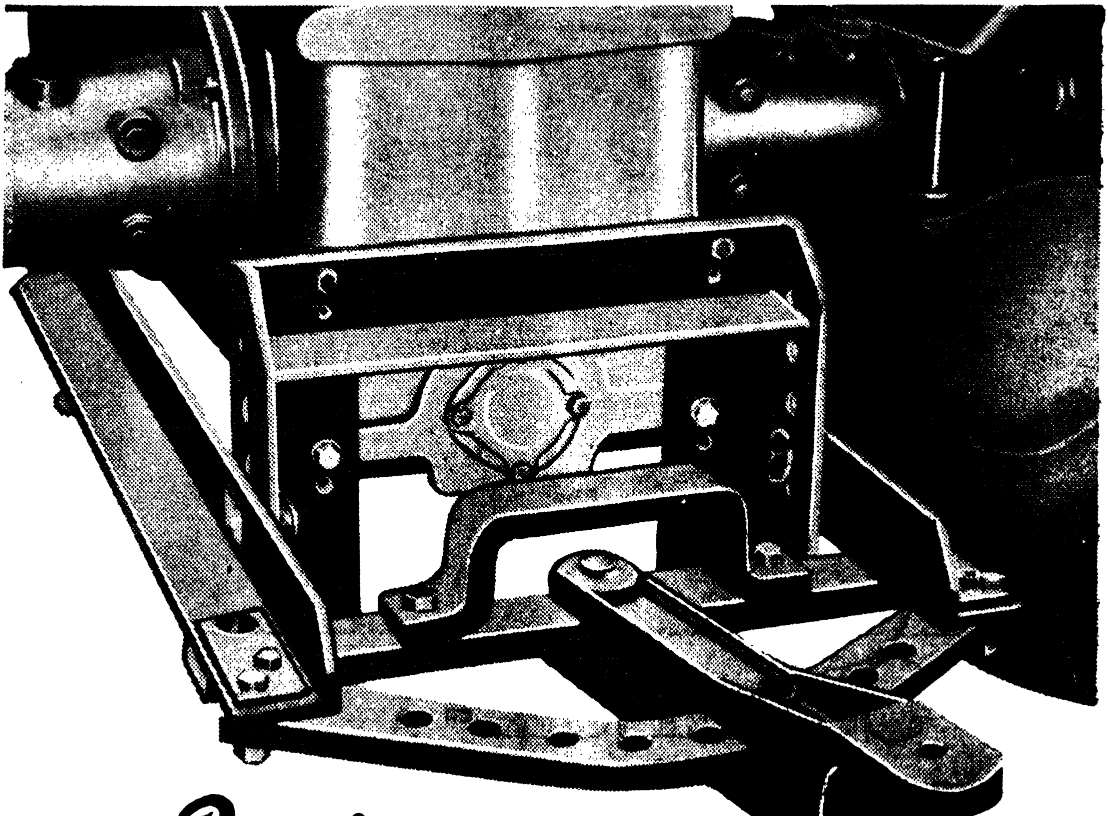
Ideally, the sowing of any hay crop should be preceded by a period of fallow with a view to controlling weeds, and the land should be worked to produce a firm, moist, compact seed-bed overlain by a cloddy mulch—which ensures a rapid, even germination. If worked too fine, there is a danger of loss of surface soil through erosion, or in some soils, of compaction of the surface after rain.

Sowing times vary throughout the State from March to July and even, in the case of oats, to September in some highland areas. Harvesting commences in early September and continues to December, according to the locality and variety used. For late sowings an early maturing variety is used, and where grain crops are grown, care should be taken that the hay harvest is completed before the earliest grain crop matures.

Generally speaking seeding is best carried out with a drill or combine, as by this method the plants are properly spaced at an even depth in the layer of soil containing the moisture required for germination, thus ensuring uniformity of growth; whereas, when the seed is broadcast, the opposite result may be obtained. If, however, a seed drill cannot be used, the broadcasting is best done when tine cultivation has left the surface of the field evenly ridged so that a light harrow drawn over the seed will satisfactorily cover it in the hollows. When broadcast, a field should be sown at a rate of about 50 per cent. or more heavier than when drilled.

Varieties.

Almost all varieties of the annually grown cereals make a reasonable hay, but usually when growing for hay alone, a special variety is sown, taking into consideration the district and time of sowing. With wheaten and oaten hays, a variety giving a good proportion of stem with not too much "flag" or leaf and having a white chaff is required. Since the recommended varieties are subject to change as new ones are introduced and others bred, the farmer should refer to the Department of Agriculture for information as to the best kinds to sow. Wheat and oat varietal recommendations are published annually in the *Agricultural Gazette,* while the local Agricultural Instructor is available to give information on this and other matters at all times.



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The fodder stored is mainly oaten hay.

Fertilisers for Hay Crops.

It is generally true that the more fertile the soil on which a hay crop is grown, the higher the nutritive value of the resultant crop may be expected to be. Greater quality brought about by growing on a fertile soil is not easily detected from mere observation in the field or in the bag, although the lack of green colour in a crop grown on a poor soil may be obvious. However, the results from feeding hay from a crop grown under good conditions are usually better than where the soil nutriment was deficient during the growing of the crop, and increases in yield which are also brought about by correct fertiliser practice, can be detected by comparison with unfertilised crops.

It may be taken as a general principle, that wherever a grain crop responds to the addition of superphosphate, a hay crop will be improved by the use of this fertiliser. If the grower does not wish to incur the expense of purchasing superphosphate, then, in general, a crop of oats will do better in the absence of fertiliser than would a wheat crop.

In recent years, the practice of using a fertiliser containing nitrogen on the hay crop has become more popular and several of the fertiliser companies have at various times made a special fertiliser for this purpose. Generally speaking, the mixture recommended comprises superphosphate and sulphate of ammonia, in the proportion of either two or three parts of superphosphate to one part of sulphate of ammonia. The rate of application used varies from half a bag to a bag, that is 80 to 160 lb. of this fertiliser to the acre. Under conditions of fair rainfall, the use of such a fertiliser would undoubtedly increase yields, and by reason of the nitrogen contained, tend to improve the nutritive value of the hay produced.

Cutting and Handling.

With the exception of oats, cereal crops are cut for hay at, or shortly after, flowering, although the dry weight increases until three weeks or more after the completion

of flowering, when the seed is in the late dough stage. Oats are cut when the seed is in the late dough stage mentioned, and this is indicated by the earlier maturing panicles, usually located at the top, beginning to lose colour and go white (in some varieties) and hardening of the most mature seeds.

Usually the material is cut with the reaper and binder, although in light short crops, which it may be difficult to handle with the binder, or where no binder is available, a mower may be used. However, if a crop is too short and thin to cut effectively with a binder in good condition, usually a mower will not touch it either. The tying mechanism should be adjusted so that the band is tied to give a well balanced sheaf when pitching. The thickness or thinness of the crop does not greatly affect the tying, but in very short crops, say less than 15 inches high, it is difficult or impossible to make decent sheaves. In such crops the binder may be used with no string in the sheaf tying mechanism and a piece of hessian fastened firmly to the side of the binder and carried on the sheaf carrier. As the hessian becomes filled with the cut material it can be dumped periodically in cocks thus doing away with the need for a rake.

An alternative method, dispensing with the hessian, may be used in thin crops or where the cut material is to be gathered by a pick-up baler. Either the twine is removed from the knotter and the cut material allowed to fall from the machine in a continuous windrow, or the elevator canvas can be removed, and the transverse canvas behind the knife may also be shortened, so that the material passes along the transverse canvas and drops out in a windrow with the heads all lying the one way and at a slight angle to the direction of travel, from which position it is readily picked up by the baler.

Using the Binder.

When entering the crop, cut at least two rounds before attempting to cut the back swath or piece knocked down by the horses. The precautions regarding the tying of the sheaf somewhere about the point of balance should be remembered. When the crop is very tall, and with machines that permit of so doing, the mechanism operating the packers and supporting the butter board should be adjusted so as to give as much room as possible on the length of the table.

Raise or lower the reel as the height of the crop requires. In a short, thin crop, the beaters should be low so as to prevent the material lodging on the knife or falling in front; the beaters should be right down on the fingers so as to sweep the material on to the canvas. The efficiency of the beaters for dealing with light crops can be greatly increased by tacking or screwing leather to them so that the edge of the leather sweeps the fingers when the reel revolves, striking the ridge at the back of the knife and sweeping the short straws on to the canvas. The reel as usually supplied cannot be adjusted closer than about three inches from the blades.

For a very light crop the binder may be further improved by inserting a piece of tin or galvanised iron under the first roller holder and allowing it to project until it meets the clip on top of the fingers.

A light, thin crop can be cut better if a little on the dry side. If the crop is leaning away from the knife put the reel forward so that the beaters will be lifting the crop backwards when the knife reaches it. Laid crops can only be dealt with by cutting them in the opposite direction to which they are lying. This entails working the binder only one way and when the crop is tangled as well as laid, considerable patience and judgment are required to make the most of it. All that can be done is to drive the binder with care, seizing every opportunity to drive it against the direction of the majority of the laid plants.

The sheaf carrier should be dropped as the fourth sheaf leaves the table, otherwise excessive force may break the knotter casting.

Preserving the Quality of the Cut Crop.

Binding the crop and stooking the sheaves protects the material from rain damage and bleaching by the sun. Winter-grown cereals are easily cured by this method, but under warm humid conditions there is some danger of mould development in the centre of tightly-bound sheaves.

In curing loose hay, rough and unnecessary handling are to be avoided, as they tend to cause loss through the breaking up

and powdering of the plant, particularly the more nutritious leafy parts. Losses of this type are aggravated by allowing the material to become too dry before cocking.

The best cured cereal hay results by rapid drying, and, if possible, sowings should be arranged to avoid wet periods, as, although by turning the stooks the effects of rain in causing mould can be mitigated, extra labour is needed, and loss by leaching of valuable ingredients occurs. Mild, dry weather with a light breeze is ideal for haymaking, and under these conditions loose hay can frequently be stacked direct from the windrows, giving a fragrant green hay. Under very hot conditions, or if rain threatens, the swath should be raked and stooked as soon as possible.

The hay should be stacked or baled before it becomes brittle enough to permit of shattering or powdering. Mustiness and excessive dust are serious defects and are to be avoided. With cereal or grass hays the stage of drying can be judged by drawing a few straws from the inside of a sheaf or cock. The "knots" or nodes should be examined, and once they are thoroughly dried and show signs of shrinking, the hay may be carted in with safety. Also if any straws break, when a small bundle is twisted in the hands, the hay is ready.

Stooking.

To minimise loss at haymaking time, sheaves should be properly stooked without delay after they have been cut with the binder, to lessen the effects of sun and rain. When a couple of swaths have been cut sufficient men should be employed stooking to keep up with the machine. In a light crop one man can stook the sheaves as fast as the binder can cut them, but in a two-ton crop, two men are not sufficient to keep pace with it.

The sheaves in long, open stooks dry more rapidly than in round ones, but in the former more of the crop is exposed to the bleaching action of the sun. Long, open stooks, or small round ones of eight or ten sheaves, depending upon the thickness of the crop, are therefore suitable for moist districts, while the practice of making large round stooks is adopted for dry areas.

In stooking, sheaves are picked up two at a time and placed together with the butts to the ground a short distance apart, and the heads leaning together. Further sheaves are either placed alongside the first two to form a tent-like row, or sloping in to a common centre. In the making of large round stooks in dry districts, additional sheaves may be built up in layers around the central nucleus.

Some farmers cap their stooks with sheaves placed, head downwards, above those resting on the ground. The capped sheaves are held together in position by tucking a handful of hay from the side of the sheaf under the band of the adjoining one. The stook is then crowned, with the butts of the capping sheaves forming a solid mass pointing up, to catch rain. Although this arrangement collects rain, it is led down the straws and diverted from the heart of the stook to the outside.

Curing may take from ten to twenty days according to the weather conditions and time of the year. Care should be taken not to bring the material in too early or it will heat or mould, while the disadvantages of excessive drying have already been mentioned. As soon as the contraction of the upper joints is seen the material should be brought in; left lying it becomes hard, and difficult to chaff.

Quite inferior material will make fair chaff and has some value for feeding, but the farmer should always aim at having a superior article to obtain the greatest nutritive value and the maximum return for his product.

(*To be continued.*)

CELERY growing shows promise of developing into a profitable industry on the Murrumbidgee Irrigation Area, reports Mr. A. C. Orman, Special Agricultural Instructor of the Department of Agriculture.

"Following successful tests with celery carried out by the Department, the Leeton Co-operative Cannery arranged for the production of approximately 60 tons under contract at Leeton during the present season. The crop is now being harvested with excellent results. Mr. S. Shirmer, who was responsible for growing celery on a commercial scale in the first instance under the supervision of the Department, has produced a crop which has returned a yield of over 40 tons per acre. Celery growing represents a new industry on the M.I.A., which, provided rapid transport is available, should develop into a profitable one. Apart from the high yields, the quality of the celery is exceptionally good."

FRUITGROWING.

Passion Fruit and Citrus.

Partners or Rivals?

◆

K. D. McGILLIVRAY,
Fruit Officer.

A Contour-planted Passion Fruit and Citrus Block at Langley Vale, owned by Mr. R. Sowter.

MOST of our passion fruit has been, and still is, produced in association with citrus growing. As a catch crop, passion fruit has lowered the costs of establishment of citrus coastal orchards by bringing in some cash return while the young citrus trees are growing. This is excellent short term economics, but, in certain circumstances, it can be bad long term land use.

Citrus growing is the more important industry of the two, however, and the new grower must never lose sight of the fact that a productive citrus orchard is his goal. If his soil management only takes the catch crop into account, he may get the bill later in lower soil fertility and poorer tree growth. Properly managed passion fruit, however, can set a grower on his feet financially and not impair the fertility of his land. Passion fruit and citrus can be successful partners.

Passion fruit is often the first, or one of the first, cultivated crops on our citrus land, and is thus given access to its virgin fertility. We must avoid growing catch crops which exploit the fertility without provision for its replacement and which expose the soil to erosion by water.

There is no doubt that well managed passion fruit plantations in suitable areas are profitable, and are likely to continue to be profitable at lower prices than those of recent years. This crop deserves a permanent place in our fruit-growing industry.

There are two essentials to successful passion-fruit growing, apart from pest and disease control, namely (1) the maintenance of fertility and (2) the minimising of soil erosion. These must be assured if a permanent plantation of passion fruit is to succeed, but they assume an added significance when passion fruit is grown as a catch crop.

Soil Fertility Must Be Maintained.

In this task on maintaining soil fertility we must remember that where passion fruit is to be grown in association with citrus the roots of the vines are in the virgin soils ahead of the citrus tree roots. Stimulated by artificial fertilisers, they make demands on other minerals not over-abundant in some of our soils. Also that the frequent tillage

often associated with passion fruit growing will burn out the organic matter.

We should be prepared, therefore, to follow a balanced manuring programme of artificial, animal and green manures or cover crops if we want to keep up fertility ahead of the advancing roots of young citrus trees. We cannot start on a balanced manuring programme too early in the life of a citrus orchard. When we grow passion fruit between citrus trees the time to start the balanced manuring programme is when we start to manure the passion fruit vines.

Contour Planting Minimises Soil Erosion.

The second essential is the control of soil erosion. About 2,000 acres of virgin land have been cleared recently on the coastal highlands for citrus planting, and more than 1,500 acres of it should be contour planted. One grower said to me: "This contour planting may be all right, but what about straining passion wires around your curves?" The answer to that question is: "It can be done, and is being done successfully."

Passion fruit will be on the land for three or four years; the citrus trees may be there for fifty years. It does not seem reasonable to adopt a faulty square planting lay-out and to suffer erosion throughout the life of the trees, merely to accommodate the vines. Therefore, it is wise to design the planting of trees and vines on the contour where this is advisable.

It can thus be seen that to ensure a successful partnership of passion fruit and citrus growing, both early in the project and in the later years when the citrus trees are coming to maturity, it is necessary to commence a well-balanced manuring programme during the growing of the passion fruit crop, and not to allow the convenience of square planting of passion vines to interfere with the contour planting of the citrus orchard where this is desirable.

ORCHARD HEATING

To Prevent Frost Damage.

(*Concluded from page* 302.)

J. R. DAVISON, Fruit Inspector.

IN the previous sections of this article, which have appeared in the May and June issues, the author described the causes of frost, the principles of orchard heating, the influences of cultural practices on frost occurrence and the equipment used in trials conducted at Yenda.

In this concluding instalment, details of the trials are given, and the present position of orchard heating on the Area is discussed.

Results on Mrs. Hudson's Farm.

On this farm, 12 acres of vines, in two blocks of 7 acres and 5 acres respectively were heated.

The heaters used comprised 540 square type burners, 100 5-quart lard pail type, and 100 2-gallon lard pail type, both these latter with dampers.

The burners were spaced about 15 yards apart, in alternate rows, at the rate of sixty to the acre, double the number of pots being placed on the up-drift ends of the orchard blocks, which are naturally the coldest parts.

The Heating Carried Out.

First Frost.—The first frost, after bud movement, was experienced on the morning of 12th September. The alarm bell rang at 2 a.m. and temperatures of the outside thermometers were 34 deg. Fahr. As the temperature began to fall, and as most of the oil heaters were new, lighting up was commenced a little earlier than possibly would have been necessary with well-sooted burners.

As soon as all of the new, and 50 per cent. of the old heaters (*i.e.*, alternate heaters) were lit, thermometer readings were taken and were as follow:—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	30.3	Outside ..	30.5
Inside ..	39 and 40	Inside ..	*36 and 39

* The difference here was due to the former section being lit last and the temperature taken first.

Alternate pots were then smothered, as only a short period of time is needed to soot up a burner enough to make it easy to light again, and speed of lighting the burners

is very necessary if both fuel and vines are to be saved.

At 6.30 a.m., sun up, both outside checks were above 32 deg. and rising, so all burners were put out, the operation being completed by 7 a.m. In this half-hour all thermometers showed a rise of 5 degrees.

The heating time was from 4 a.m. to 6.30 a.m.—two and a half hours.

Second Frost.—The alarm rang at 12.30 a.m. on 13th September, and at 1 a.m. temperatures stood at:—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	31	Outside ..	33.5
Inside ..	33 and 34	Inside ..	33 and 32.5

Lighting of alternate pots was commenced at 1.30 a.m. During the whole of the burning period, the inside temperatures were 33 deg. Fahr. At 5 a.m. they were—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	29	Outside ..	31.5
Inside ..	33 and 33	Inside ..	33 and 32.5

At 5.30 a.m. some pots which had been burning the previous night commenced to burn low, and because a sudden drop of up to 2 deg. Fahr. often occurs at this period extra fires were lit to compensate for those burning low.

At 6 a.m. temperatures were recorded—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	31	Outside ..	31.5
Inside ..	33 and 33	Inside ..	33 and 32.5

Owing to a heavy pall of smoke obscuring the rising sun, the air temperature was quite some time in rising. Actually the smoke had to clear away before a safe rise was noted.

The heating time on this day was 1.30 a.m. to 7.30 a.m.—six hours.

Third Frost.—Although the alarm bell rang at 2 a.m. on 14th September, on this occasion the fall in temperature was very gradual. Readings taken at 2.30 a.m. were—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	33.5	Outside ..	34
Inside ..	34 and 34	Inside ..	33 and 33.5
	and at 4.30 a.m.		
Outside ..	33.5	Outside ..	33
Inside ..	34 and 34	Inside ..	34 and 33.5

A sudden drop to 32.5 degrees in the check outside necessitated a lighting up, which was commenced in the northern block from the drift direction and completed by 5.30 a.m. Only 50 per cent. of the heaters were lit, and none in the down-drift section (southern block). Temperatures here were held safe during this mild frost by the smoke screen afforded by the heaters burning up-wind.

Hooded Thermometer.
The pointed stick facilitates driving into the ground.

At 6.45 a.m. heaters were smothered. The sun was up and thermometer readings were—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	35	Outside ..	34.5
Inside ..	35 and 34.5	Inside ..	33.5 and 33

The burning time on this morning was 25 per cent. of heaters for one and a quarter hours.

Fourth Frost.—No more frost was experienced until 23rd September. The alarm rang at 2 a.m., and readings taken by 2.45 a.m. read—

Southern Block.	Deg. Fah.	Northern Block.	Deg. Fah.
Outside ..	32.5	Outside ..	33.5
Inside ..	32.5 and 34	Inside ..	34 and 33.5

and remained steady; it was doubtful whether lighting would be needed. However, it was decided to light up, and

alternate pots in alternate rows (25 per cent. pots) were lit, and readings taken showed an immediate lift as follows:—

	Southern Block. Deg. Fah.		Northern Block. Deg. Fah.
Outside	.. 33	Outside	.. 33.5
Inside	.. 35 and 35	Inside	.. 34 and 34

The small number of pots easily held the temperature, a light southerly breeze lifted all thermometers, and so the heaters were extinguished.

At 5.10 a.m. the temperatures suddenly dropped to the following:—

	Southern Block. Deg. Fah.		Northern Block. Deg. Fah.
Outside	. 32	Outside	.. 32
Inside	.. 32.5 and 32.2	Inside	.. 32.7 and 33

and the same number of pots were again lit up.

At 5.50 a.m. readings were—

	Southern Block. Deg. Fah.		Northern Block. Deg. Fah.
Outside	.. 30.5	Outside	.. 30.7
Inside	.. 32.2 and 32.3	Inside	.. 32.7 and 34

At 6.30 a.m. the fires were put out.

The burning time on this day was two hours.

At some period between 5.10 a.m. and 6.15 a.m. the minimum temperatures outside the heated areas were 29.5 deg. Fahr. and 30.4 degrees. In cases like this, when the temperature just hovers around 32 deg. to 33 deg. Fahr. for a long period, and there is the possibility of a sudden drop, it is hard to determine whether it is better to light up or not. On this occasion the first lighting was unnecessary, and only a small proportion of the fires were lit as a compromise, to make the final lighting up easy and speedy if the temperature actually did fall dangerously. The sudden fall at 5.10 a.m. showed how easily damage could result from carelessness. However, as vines have been proved to have at least a tolerance of half an hour at freezing point, and lighting up of 50 per cent. of the pots took less than half an hour, the vines in this orchard were at no time endangered in an endeavour to keep down the expense of fuel.

One point noticeable in practice is that it is harder to raise the temperature than to apply heat and keep it constant as the unheated area gets colder.

A Further Frost.—A slight period of frost was experienced on 24th September. Only 25 per cent. of the heaters were lit, but were hardly needed, as they only burned for half an hour and were extinguished.

The Total Heating Time.

The total time of all heating was—

50 per cent. of heaters for 10½ hours, plus
25 per cent. of heaters for 1¼ hours and 2 hours;
or
50 per cent. of heaters for 11½ hours;

during which period of time 546 gallons of fuel were used.

It was thus shown that, with experience, it is easy to burn just sufficient fuel to safeguard the crop without any appreciable waste of fuel or energy.

The Financial Aspect.

The following figures showing the cost of heating 12 acres on Mrs. Hudson's farm:—

CAPITAL COST.

	£	s.	d.
720 burners at 2s. 6d.	90	0	0
4 torches at 13s. 6d.	2	14	0
Thermometers	3	5	6
Alarm Circuit	3	19	6
Total cost for equipment, 12 acres	99	19	0
Total cost of equipment, 1 acre	8	6	7
12½ per cent. depreciation on equipment, 1 acre	0	19	0

EXPENSES INCURRED DURING HEATING PERIOD, 1937.

	£	s.	d.
12½ per cent. depreciation	12	10	0
Fuel, 546 gallons at 8d.	18	4	0
Petrol and kerosene for lighting, 10 gallons	1	10	0
Five nights extra man, at 10s.	2	10	0
Four days for filling at 12s. 6d.	2	10	0
Five nights taken out in day time (equivalent)	2	10	0
	39	14	0
Expenses per acre	3	6	2

Mr. T. McMahon's Farm.

During 1937 an area of 2 acres of apricots was heated on the farm of Mr. T. McMahon (No. 1568) to prevent frost damage. Sixty large capacity (3½ gallon) heaters were used for 1 acre of trees, and the other area of 1 acre was heated by the use of sixty square-type heaters.

The results were as follow:—

First Heating.—The burners were lit at 2.30 a.m. when the temperature was 32 deg. Fahr., and within an hour there was a rise to 39 deg. Fahr. This remained steady until sunrise—7 a.m.—when the fires were

smothered. One hundred and twenty pots burning for four and a half hours used 120 gallons of fuel.

It can be seen that more heat than necessary was generated. This was the grower's initial heating. Only 1 gallon was placed in each burner and most of them were spent at 7 a.m. The minimum temperature outside was 30.5 deg. Fahr.

Second Heating.—On this occasion alternate heaters were lit throughout the block of trees, and all the northern headland (updrift) heaters were lit. Seventy pots were lit at 4.30 a.m. when, at 3 feet from ground level, temperatures suddenly fell to 30 deg. Fahr. From then on 32 deg. was maintained (31 deg. at 3 feet is the unsafe temperature in apricots) until the rise outside the heated zone indicated that it was safe to extinguish the fires.

The seventy burners used 45 gallons of fuel in two and a quarter hours at a cost of 30s. in Yenda for fuel.

From observation it would appear that one man can handle 3 to 4 acres of vines or 4 to 5 acres of trees. In trees there is not the restriction, caused by vine trellises, to movement other than in one direction—up or down the rows.

Conclusions.

Since 1937, many other growers have acquired the apparatus for heating, both in this frost pocket at Yenda and in other parts of the Areas. The great majority use them on apricots, a few on peaches, and some on vines, but time has shown that under Area conditions, the increased cost of oil has made a difference in the attitude towards heating sultanas. Because of the factors inherent in low-lying plants—the early date at which heating must commence and the number of heatings as a rule necessary—few sultanas are now heated, and many of the plantings present in the frost pocket in 1937 have since been pulled out. It must be said, however, that one of the prime factors in pulling out was not altogether frost-liability, but the fact that Area summer weather is so erratic that there is always an even chance of losing the crop through rain falling during the harvesting and drying period.

On the other hand, time has proved that heating apricots is worthwhile—peaches too, although the later blossoming and setting of this kind of fruit make it less susceptible than the former. In the years since 1937, the average number of heatings per year has been only two for apricots. Only on one occasion (1946) was it necessary to heat as often as four times; sometimes it has only been necessary once. Yet in some cases, until heating was undertaken, the crop harvested had been negligible year after year.

It can be stated with confidence that heating to prevent frost damage has come to stay, although not for the kind of fruit for which it was introduced some ten years ago During the war it was impossible to procure such necessary equipment as heaters and thermometers—otherwise more heating would have been done than actually has been.

Phylloxera Resistant Vine Rootlings.

Growers Can Assist to Meet the Demand.

THE demand for phylloxera-resistant vine rootlings from the Department's Nursery at Narara has increased very greatly since the termination of the war, so that the Nursery is unable to meet the demand.

Although the supply is gradually increasing it will be a few years yet before the young plantations of mother vines are producing much wood. It is suggested, therefore, that growers who have resistant wood growing from ungrafted vines in their vineyards make up as many cuttings as possible and plant them out in a nursery plot. Although only a comparatively small number of vines could be raised in this manner, any such effort will assist in overcoming the difficult position caused by the shortage of resistant stocks.—H. L. MANUEL, Viticultural Expert.

WEEDS IN SPORTS AREAS.

Their Prevention and Control.

A. PEARSON, H.D.A., Weeds Officer.

THE modern golfer strenuously objects to any unevenness in the putting green, and the cricketer, footballer and bowler expect to find a ground as free as is reasonably possible of all types of weed growth. An occasional weed plant is in itself of little consequence, but looked on as a source of further contamination its presence must be considered undesirable.

It is the purpose of this article to discuss the weeds which infest playing fields, the means by which they become established, and the methods by which they may be controlled, including the use of fertiliser, chemicals, and the hormone type selective weedicides.

The weeds found on sports grounds in the metropolitan area differ very considerably from those that cause concern to the country sportsman. Some plants which at times are not objectionable on greens or sports fields—and may on occasions even be useful—must be regarded as weeds because they may crowd out the grass that has been planted, and then, in certain seasons become dormant and leave large patches of dead vegetation in an otherwise perfect turf. Many weeds are extremely vigorous and aggressive and are able to withstand constant mowing and yet set seed freely close to the ground.

What is a Weed?

Probably the best definition of a weed is —"Any plant growing in a place where its presence is not desired." Clover for instance, is a very desirable plant in a pasture, but in a putting green or in a bowling green it is a troublesome weed. Paspalum is a particularly valuable fodder plant in coastal districts and in some irrigated pastures, but it is probably one of the worst weeds in suburban lawns, on footpaths and in some sports areas. In a green of pure *Agrostis tenuis,* couch grass could be considered a particularly troublesome weed.

Classification of Weeds.

Weeds may be classified as annuals, biennials and perennials according to whether they live for one, two or several years. Annual weeds, of which summer grass, winter grass, trefoil, etc., are examples, depend for their survival on the production of seeds each season. By preventing annual weeds from seeding and not allowing infestation of greens by seed from other sources, weeds of this type can be controlled. Perennial weeds are usually much more difficult to control because of the persistence of the root system from year to year and the fact that they are harder to kill than any of the annual plants. They may be insignificant and hardly noticed until neglected, or possibly until some treatment especially favourable to them is given to the green, when they will suddenly commence to dominate the area. White clover is an example of a weed of this description.

Caltrops (*Tribulus terrestris*).
A weed that is spreading rapidly in country towns and neglected sports areas.

Weeds are also classified according to their root growth; some, such as cat's ear, lamb's tongue and dock, have long tap roots; others, such as winter grass, have shallow fibrous roots, while yet others such as field bindweed may have long lateral roots. Weeds with a fibrous root system are generally easier to eradicate than the other two types.

Weeds can be further classified according to their period of growth—winter growing, summer growing and so on—or again according to their type of growth, *i.e.* whether upright or procumbent. Many weeds with an upright type of growth which make very bad agricultural weeds often appear on playing fields, golf courses, etc., but their type of growth (which allows them to compete with agricultural crops) may be a distinct disadvantage to the weeds when they appear on greens which are frequently mown. Quite a few weeds of this type come up early in sown greens and cause considerable concern, whereas, actually they are of little importance and will not survive long once mowing is commenced.

Some weeds thrive best on wet, damp soils and may be very troublesome on poorly-drained greens. Plants of this nature are docks, sorrels and pearl wort. These weeds, however, if they obtain a hold on well drained greens, sometimes adjust themselves to the altered conditions and may prove very troublesome. Drainage, liming and fertiliser all play their part in eradicating weeds of this type.

The weeds with habits of growth which most nearly coincide with those of the turf grass are those most likely to be persistent and troublesome. In putting greens, artificial means may sometimes be adopted to create soil conditions extremely favourable to the turf grass and to the detriment of the weeds. On the other hand, on cricket outfields, fairways and the rough it is possible, in dealing with weeds to adopt extreme measures which could not be carried out on bowling or putting greens.

Origin of Weeds in Sports Areas.

Weed infestation of sports areas may originate in several ways; from seed, buds or runners, from corms or bulbs. A programme of weed control, to be successful, must take into consideration the probable sources of the weeds so as to guard against re-infestation. Removal of the weeds themselves is only a temporary measure, and unless re-infestation is prevented or the soil conditions changed to make them unsuitable for weed growth, re-infestation must be expected to occur.

The principal means by which weeds are introduced on to sports areas are:—

(*a*) They may be mixed in topdressing, or in farmyard manure.

(*b*) The seed may be blown on to the area by wind, or dropped by birds.

(*c*) They may be washed on to the sports areas from nearby weed-infested land.

(*d*) They may be sown as impurities in grass seed.

(*e*) They may be carried on the shoes of players, in machinery or on clothing.

To clean any area and keep it free of weeds, it is essential to combine preventive with curative measures. It may be comparatively easy to clean an area of weeds by hand weeding or by spraying, but if further seeds, runners or bulbs are introduced in seed or manure, a fresh heavy infestation may immediately appear.

It is imperative that every care should be taken to see that soil used for topdressing is free from weed seed or portions of weed plants which may grow. Cases are frequently encountered where nut grass, onion grass and oxalis have been introduced into otherwise clean areas, in soil used for topdressing.

In making new greens the topdressing soil should be free from weed seeds, otherwise the grass will suffer too much from the competition from the weeds. Some weeds introduced in this way will spread quickly and permanently damage greens before they can become established.

Weed seeds in the topsoil may be largely controlled by cultivation. In a new green it is important to get the weed seeds germinated before the green is planted. The germination of weed seed can, of course, be encouraged by watering and the creation of a good seed bed. As soon as a large number of plants appear above the ground they can be killed by cultivation and this process will bring fresh seeds to the surface for further germination and later, killing By frequently repeating this process the bulk of the weed seeds can be killed before the green is planted.

When asked to lay down any green or lawn or sports field, the person in charge should ensure that he has sufficient time to prepare the soil thoroughly and free it of weed seed. Under no circumstances should the planting be rushed before the area has been thoroughly prepared—as a rush job may mean trouble with the green for several years.

Many weed seeds are light and fluffy and can be blown on to greens or sports fields from the adjacent rough or from nearby properties. Timely mowing of likely areas of infestation to prevent the weeds seeding will do much to prevent introduction of seed from this source. Plants which may not be objectionable elsewhere on a golf course might be very objectionable on a green. Traps, grassy mounds and high ground in the vicinity of greens should be watched to see that they are not producing weed seeds. Water flowing on to a sports area frequently causes heavy seeding down in weeds and it is essential, therefore, that action be taken to divert any water that may flow on to a green or sports field from some outside source.

When buying seed it is essential to see that it is free from all weed seed impurities. The best quality seed may be more expensive per lb., but it is cheaper in the long run, as clean seed will save many hours and days of labour. It is well worthwhile to have seed that is to be used for sowing a green tested for weed seed impurities. The Agricultural Seeds Act prohibits the sale of seed containing certain weed seeds, but it is quite permissible to sell seed containing small quantities of many impurities which would be regarded as bad weeds on a putting or bowling green.

Sometimes when stolons are purchased for planting an area, weed seeds or weed plants are introduced in the soil adhering to the roots. It is worthwhile, therefore, to inspect any outside nursery for the presence of weed plants before making arrangements to purchase stolons for planting. Some clubs have their own nurseries. It is considered that this practice could well be extended, as a greenkeeper himself could then take adequate precautions to see that his nursery was kept free from objectionable plants, and to prevent both seed and roots of weeds being introduced into the club grounds when a fresh area was being laid down.

Weed seeds are very frequently introduced in clothing, machinery or from the tyres of cars and lorries. It is surprising the amount of seed that will be found in the cuffs of a man's trousers if he has walked through a paddock where any plant is in seed. Plants such as khaki weed and caltrops are spread extensively by the seed adhering to the tread on car and lorry tyres.

Nut Grass (*Cyperus rotundus*).
A particularly difficult weed to kill. It is sometimes introduced into sports areas and lawns in topdressing material.

Large type mowers often carry weed seeds about; the seeds lodge on them when used for mowing portions of the rough or some adjacent land that may be well in seed.

In a new green, if weeds are bad, hand weeding should be commenced early. Most of the upright growing types of weeds may be left for the mower to deal with, but if there is an infestation of troublesome types the hand weeding should be undertaken immediately the soil has settled down sufficiently to permit men to work on it. The work can be done much more easily and quickly when the plants are small than when they have developed and become deeply rooted. The longer they are left, the more damage they will do in smothering the seedling grass and when older weeds are removed

they cause much more damage to the turf than when small seedling plants are killed.

It is important to see that the person operating the mower each day takes out any individual weeds as he sees them, and that he should realise that it is part of his job to remove these weeds rather than just run over them with a mower. Those types of weeds that will not pull easily when they are young, can be cut off with a knife well below the surface of the soil. Where a green is badly infested it should be marked out in sections with twine and gone over systematically so that no individual plants are missed. When weeds have been removed from a green by killing or cutting, a true surface should be restored again immediately by topdressing. It is emphasised that care should be taken to see that this topdressing is free from all harmful impurities.

Influence of Fertilisers on Weeds.

At one time plant foods were supplied to the turf by using various types of animal manures. While this method of fertilising is satisfactory in gardens where weed seedlings can be killed by cultivation, it is not advisable on playing greens because all types of weed seeds are introduced by the method. In addition, on bowling greens and putting greens, the application of animal manures interferes with the playing quality and appearance of the green. It is not advisable to use any type of animal manure unless it is used as a component of compost.

Liming is often necesary, but it should be remembered that if large quantities of lime are used on any soil without the addition of some form of nitrogenous fertiliser, the liming will definitely encourage all types of leguminous growth. Sulphate of ammonia is, of course, a nitrogenous fertiliser and is largely used on all greens. This fertiliser is particularly suitable for encouraging growth in grasses, and actually discourages the growth of most types of weeds. The crowding effect caused by the vigorous growth resulting from regular applications of sulphate of ammonia also helps to crowd out weeds by increasing the vigour of the lawn grasses.

Superphosphate is necessary in small quantities, but it is a fertiliser which encourages leguminous growth, so that if it is found that clovers and trefoils are increasing on any lawn, sports field or green, it is advisable to reduce the amount of superphosphate being used.

None of the fertilisers is effective in completely controlling weeds, but used judiciously they do play an important part in weed control, and in encouraging or discouraging the growth of particular plant species.

(To be continued.)

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Wentworth (W. B. Crang Jnr.) ...... July 16
Condobolin (N. J. Hanlin) .... August 5, 6
Albury Sheep Show and Fair
(A. G. Young) .... August 5, 6, 7
Trundle (W. A. Long) .... August 12, 13
Peak Hill (C. McDowall) ...... August 19, 20
Parkes (S. L. Seaborn) ..... August 25, 26, 27
Young (Thos. A. Tester) ..... September 2, 3
Wagga (G. Dewey) .... September 2, 3, 4
Forbes Show and Sports Day
(E. R. Woods) .... September 6
Corowa (W. T. Easdown) ... September 12, 13
Leeton (L. C. Tweedie) .... September 23, 24
Walbundrie (C. Leischke) .... October 1
Hay (G. Johnston) .... October 3, 4
Albury Annual Spring Show
(A. G. Young) .... October 7, 8, 9
Kyogle .... October 8, 9
Lismore National .... October 14, 15, 16
Alstonville .... October 22, 23
Murwillumbah .... October 29, 30
Mullumbimby .... November 5, 6
Bangalow .... November 12, 13
Nimbin .... November 19, 20

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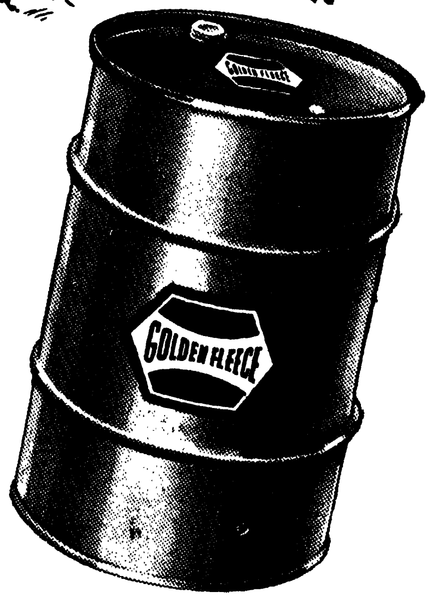

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THE MAKING OF SILAGE.

A Succulent Conserved Fodder

Suitable for Drought Feeding.

(*Concluded from page* 294.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

SILAGE making is a process whereby succulent green feed can be conserved with a minimum loss of digestible food material. Silage has a place among conserved fodders, primarily as a drought feed, but also as a supplementary feed when pastures are insufficient.

This is the concluding portion of an article which commenced in March issue. Previous instalments have described the process of silage making; the making of silage in towers, trenches and stacks; and silage made with chemical additions. This final section deals with crops suitable for silage, and with feeding silage to sheep and cattle.

Silage Crops.

In the production of all classes of conserved fodder, the farmer normally endeavours to obtain the greatest possible yield of food material from each acre. However, when feeding high-producing animals the question of an adequate protein supply must be considered in relation to total yield.

Ensiling is a process enabling the production of a foodstuff of high protein content; losses in protein content during silage making are low if the proper precautions are taken. The digestibility of the protein is improved rather than impaired during ensiling, which is not the case when a crop is made into hay. The A.I.V. Process and its modifications, and in particular the making of molassed silage, permit of the preparation of a product with a high protein and high vitamin content. It is recommended that, in general, crops for ensilage should be cut rather earlier than they commonly are at present—in the case of the winter cereals they should be cut at early flowering time.

The crops suitable for silage making are treated in more detail below.

Summer Cereals.

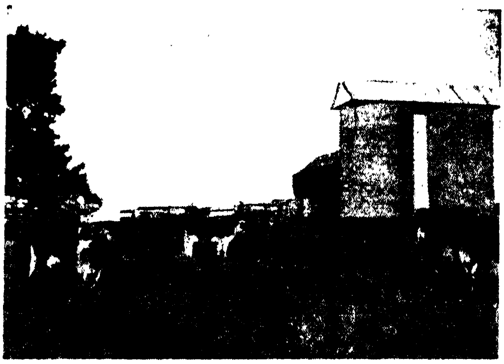
Maize.—Maize makes good silage if cut when the cobs are well formed and the grain is filling. In the case of red and yellow varieties the grain will be showing a little colour, but should still be milky.

Maize Makes Good Silage if Cut at the Correct Stage.

A good average crop would yield 20 tons of green material.

Both maize and sorghum dry out quickly after a frost, to which they are very susceptible. They should, therefore, be cut before they are frosted if possible. In dry times these crops may dry off prematurely, particularly in inland districts, but by the use of molasses fair silage can still be made.

Cutting is most conveniently done with a maize binder, although a cane knife or a chipping hoe with a 12 to 14 inch handle is often used.



Overhead Silos on a South Coast Farm.

The yields from maize vary between 15 and 30 tons per acre, but a good average crop would be about 20 tons of green material.

Sorghum.—The saccharine sorghums also make an excellent silage with plenty of sugar in it, which is much relished by cattle. They should be cut when the heads are well out but the grain still on the soft side.

Yields vary from in the vicinity of 13 to 20 tons to the acre, being lighter, therefore, than maize is. The mode of harvesting is the same as for maize.

Japanese Millet.—This is another very satisfactory silage crop, and is of value because of the rapidity with which a crop can be grown. If summer rainfall arrives later than expected quite a fair cut can frequently be obtained by sowing Japanese millet, which can be cut within 6 or 8 weeks.

The crop is cut as the seeds start to fill, and the yield varies between 8 and 10 tons per acre on the coast. The crop is best cut with the reaper and binder, although a mower can be used and the material carted in loose.

Winter Cereals.

Wheat.—Wheat for silage is cut at early flowering time, and yields vary from 4 tons to the acre upward to about 10 tons per acre.

Oats.—Oats are also cut at flowering for silage, and not when the grain is formed. Yields are frequently a little higher than for wheat, say up to 25 per cent. Oats are a very suitable winter cereal for sowing for all classes of conserved fodder. They will do better than wheat on less carefully prepared fallows and with less fertiliser. On the coast they are particularly valuable, as they take more kindly to the acid soils usually found.

Barley.—It is recommended that this crop should always be cut for silage, as the long awns on the seed head make it unsuitable as a hay crop. The stage to cut is again early flowering time.

Rye.—Rye is another crop suitable for cutting for silage, although it may be used for green feed for dairy cattle in the same way as barley frequently is. Rye is said to be more tolerant of hard conditions than the other cereal crops, and should do better than they do on cold stony ground.

Pastures.

In harvesting pasture growth for silage, cut when the principal plant species is in flower. In the case of paspalum, early cutting while the ergots are in the "honey dew" stage avoids the danger of digestive troubles when feeding later. The pasture is usually cut with a mower, and a sweep rake is very useful for handling the cut grass. Yields vary considerably.

The cutting of excess pasture growth for silage permits of an improvement in the sward by allowing surplus growth to be removed at the best time for the pasture. Silage should be made, whenever possible, from the better quality material offering at times which are unsuitable for hay making. Silage making is complementary to hay making, and there is considerable scope for an extension of this method of pasture management, viz., cutting of excess growth which cannot be eaten down by stock in order to allow more vigorous growth of the remaining sward.

A further advantage of silage making as opposed to hay making in the conservation of pasture products, is the aspect that silage making permits of cutting earlier and, under more uncertain weather conditions, thus

allowing the pasture to make good growth and protect the plant roots and soil surface from the drying action of the sun later in the season, or the ill effects of hot winds and other adverse factors.

Clover and Lucerne.

Clover and lucerne are best cut at flowering time. With lucerne the first and last cuts are usually the safest proposition for silage making, as this crop generally has too high a moisture content and insufficient carbohydrate for proper fermentation. By the use of molasses or acid a high protein silage of excellent quality may be prepared. The yields from lucerne vary from 2 tons per cut upward, and four or more cuts per season may be obtained.

Vetches and Peas.

Vetches and peas are cut at full flowering and when the pods are beginning to form. As a silage crop they have certain disadvantages, viz., their bulky hollow stems and fairly high moisture content under some conditions. A recent development is the use of pea viner trash for silage making. This material has become available in fair quantities in the vicinity of canneries preserving green peas. Being a by-product, it is available at reasonable cost. Reports received of its preservation in both stack and trench silos state that the product obtained is of a very good quality and very suitable for all classes of stock normally fed on silage.

A Crop of Rye Grass, Subterranean Clover and Trefoil at Wagga being Cut for Silage.

It was conserved in a pit, the yield being 60 tons from 5 acres.

Other Crops.

Other crops which can be used for silage include sunflowers, which are cut at the flowering time, artichoke tops, kale, cowpeas, turnips, pumpkin tops, thistles and willow leaves. In Palestine, orange pulp from the manufacture of orange juice has been used for silage and is said to have been satisfactory as a fodder for dairy cattle.

How Much Silage Should be Stored.

In a consideration of this problem the farmer has first to decide on the degree of feeding that is to be carried out. That is to say, are cattle, for instance, to be regularly fed silage as a supplement to natural pasturage during all but the flushest growing periods of the year? or, alternatively, is silage to be kept as a reserve to carry stock through severe droughts, the object being to maintain them on a plane of nutrition little above mere existence?

Where silage is to be maintained as a drought reserve only, then the farmer must decide also for himself the size of his reserves, taking into consideration his estimate of the probable duration of a drought, based on his own or others' local knowledge. A very reasonable proposal put forward recently by a farmers' association suggested a nine-months' reserve as being a suitable guarantee against losses from severe drought.

Silage reserves, although ideal for drought feeding, are only part of a complete reserve fodder programme. Cereal or lucerne hay, depending on the class of stock carried, and stored grain, are complementary with one another and with silage in any complete programme. Obviously large stocks of silage

will be required where considerable quantities of hay are stored.

Silage for Sheep.

With sheep, Departmental trials have shown that, while silage will maintain life for fairly long periods, sheep lose condition if they receive it as a sole diet. It can replace hay and other more expensive fodders in a ration, and, provided some other feed is given, forms an economical diet.

Thus better results are obtained by feeding 1 lb. of hay and 1½ lb. of silage than with 3 lb. of silage alone per sheep per day; while 1½ lb. of silage and 4 ounces of maize has proved much better, on Departmental farms, than 2½ lb. of silage alone.

While the sheep are strong not more than 1 lb. of silage need be given per day—and this is the correct time to commence feeding —before too much condition is lost. The stock will become accustomed to the feed and the ration can eventually be raised if necessary to 3 lb. a day, provided some hay, grain, or dry feed is available.

In calculating rations for sheep, 1 ton to 1½ tons of silage per 1,000 head per day would constitute the maximum requirements. From this figure can be calculated the amount of silage which should be stored for a flock of any size. Two 35-ton pits of the trench type which have been described earlier in this article would be sufficient, therefore, to maintain 1,000 head for about two months, feeding 2 to 2½ lb. per head per day. This would be a very generous allotment and, in actual fact, if stocks of grain and hay were available as well, this quantity would probably last nearly twice that period.

Silage for Dairy Cattle.

In this State dairy cattle need supplementary feeding during a large part of the year. Usually, only during spring and early summer are pastures alone sufficient for good milk production. Silage is excellent for supplementing pastures.

Good silage is very palatable; cattle will eat up to 70 lb. per day of most silages and up to 100 lb. per day of grass silage. When supplementary feeding, give all the silage, or silage and hay or chaff that the cows will eat, and concentrates in addition. Cattle may take up to 40 lb. silage and 10 lb. of hay where pastures are limited. It would be safe to budget on 1½ tons of silage lasting a dairy cow for two months.

The amount of concentrates will depend on the cost of concentrates, price for milk and production of the cows. The type of concentrates will depend on the type of silage and hay being fed. Low protein silages, such as those made from maize, sorghum, millet or oats, need high protein concentrates; that is, concentrates containing linseed meal, peanut meal, etc. High protein silages, such as lucerne or clover, or low protein silages with lucerne hay, need only low protein concentrates such as crushed grain.

Details of amounts of concentrates and suitable mixtures are contained in the Departmental pamphlet "Feeding for Milk Production," which may be obtained on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A G.P.O., Sydney. However, typical rations for cattle with very limited pasture are as follows:—

Maize or sorghum silage	30–40 lb.
Lucerne hay ...	10 lb.
Crushed grain—maize, oats, barley, grain sorghum or wheat (exercise care with wheat —with or without bran and pollard).	1–2 lb. per gallon if obtaining butter fat price. 4–5 lb. per gallon if obtaining whole milk price.
Maize or sorghum silage	50–60 lb.
Mixture of crushed grain, 3 parts; linseed meal, 5 parts, or crushed grain, 2 parts, peanut meal, 1 part, or crushed grain, 1 part, bran or pollard, 2 parts, linseed meal, 3 parts.	1–2 lb. per gallon if obtaining butter fat price. 4–5 lb. per gallon if obtaining whole milk price.
Lucerne silage ...	50–60 lb.
or	
Lucerne silage ... and Oaten or wheaten chaff	30–40 lb. 10 lb.
Crushed grain ...	1–2 lb. per gallon if obtaining butter fat price. 4–5 lb. per gallon if obtaining whole milk price.

(*Continued on page* 378.)

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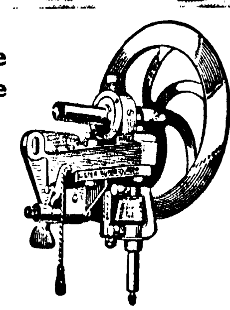

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PLANT DISEASES

DISEASES OF CHERRIES.

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

A NUMBER of diseases, the most important of which are Brown Rot and Bacterial Canker, affect cherries, causing annual losses of fruit, tree vigour, limbs and trees. These losses can be reduced by careful attention to correct and thorough spraying and to general orchard hygiene.

Brown Rot.

This disease, which is capable of destroying an entire crop of fruit, is caused by the fungus *Sclerotinia fructicola*. Its two most serious effects are: (1) an attack on the blossoms which prevents the setting of fruit; and (2) the production of a rot on mature and nearly mature fruit, both on the tree and after picking. Leaf and shoot infections also occur, resulting in considerable damage to these portions of the tree.

When blossoms are attacked they die and turn brown, some falling, whilst others persist for several weeks adhering to the gum which is formed later as the result of the infection of the shoot.

Following the blossom blight, developing fruits may be attacked, but in normal seasons this does not occur until the fruit is approaching maturity, when the disease first becomes evident as small brown spots on the skin, upon which ashy-grey, powdery tufts of the fungus develop within a day or two. The entire fruit rots rapidly and after a time dries out to become wrinkled and leathery, and is then known as a "mummy." Within the "mummy" the fungus lives through the winter, and under favourable conditions the following spring, can produce a crop of spores which will attack the blossoms and result in a recurrence of the blossom blight and other aspects of the disease outlined above.

Control.—All diseased shoots should be cut out, and all "mummies" removed from the ground and trees, paying particular attention to the crotch of the tree. "Mummies" should be buried to a depth of 6 inches, or burned with the prunings.

Spray with Bordeaux Mixture 15-15-100 plus a spreader, just before or at "bud swell." (This spray application is also recommended for the control of leaf curl, shot hole and rust.)

These preliminary measures are essential and will materially reduce the possibilities of infection. However, further sprays consisting of lime sulphur 1-160, plus an efficient spreader should be applied at the following stages:—

(i) At "blossoming" (when the majority of the blossoms have fallen).

(ii) At "shuck-fall" (when the flower remnants are shed from the fruit).

(iii) At intervals of three to four weeks from "shuck-fall" until the fruit is harvested, if showery weather is experienced, or if blossom blighting has occurred.

Fig. 1—Brown Rot in a Box of Cherries.
Note brown spots on the skin of the fruit and the development of ashy-grey powdery tufts of the fungus.

(iv) If the weather is very humid, a spray should be applied during the seven day period prior to harvesting, and under these conditions further sprays applied between pickings are desirable.

Shot Hole.

The most common "shot hole" disease of cherries in New South Wales is caused by the fungus *Clasterosporium carpophilum*. This disease first appears on the leaves, as small brown spots with a reddish margin. These spots gradually dry and fall out, giving the characteristic shot hole appearance. Twigs are also attacked, an exudation of gum being the major symptom.

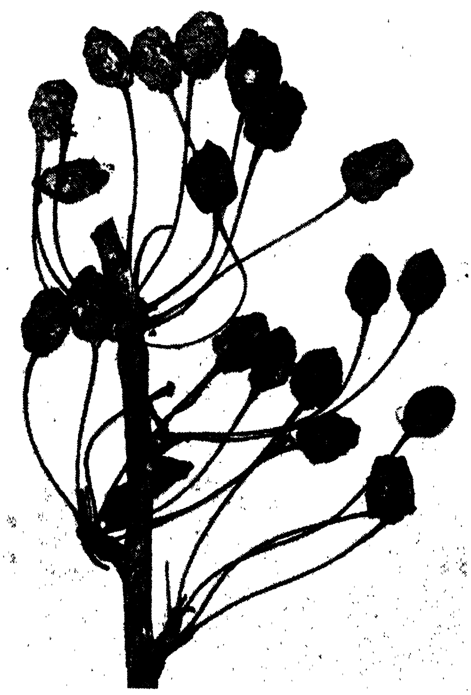


Fig. 2—Cherries "mummied" on the Tree by the the Brown Rot Fungus.

Every effort should be made to remove such "mummies" from the tree and from the ground.

Considerable destruction of leaf tissue may occur and trees become prematurely defoliated. If the disease is not checked, it will have an adverse effect upon tree vigour, resulting in a decrease in the quantity and quality of fruit.

Control.—Prune out infected twigs where possible. Spray with Bordeaux Mixture 15-15-100 plus an efficient spreader, in autumn when most of the leaves have fallen and again at bud swell. (Note that the spring spray represents part of the brown rot programme, and that the autumn spray coincides with the bacterial canker programme.)

Rust.

Rust is a fungous disease caused by *Puccinia pruni-spinosae*, and on cherries is confined almost entirely to the leaves.

The upper surface of an infected leaf becomes speckled with small, yellow patches which often run together, whilst on the under surface there are corresponding powdery spots of an orange-red or rusty brown colour. Later the under surface of the leaves will give the appearance of having been coated with a brown dust. Infected leaves fall prematurely, and trees which are infected in consecutive seasons become considerably reduced in vigour.

Control.—The spray programme recommended above for the control of brown rot will control this disease also.

Bacterial Canker.

Bacterial canker, which is caused by *Pseudomonas cerasi* var. *prunicola*, is one of the most destructive diseases of stone fruits. The effects of the disease are most severe on young trees, particularly cherry and apricot, large numbers of which may be killed out in a season.

Leaf spotting, bud and blossom blighting and fruit infections occur, but the greatest destruction is brought about by an attack on trunks and limbs. A copious exudation of gum, surrounded by an area of dying bark, appears upon the affected portions. Later these areas, which are known as cankers, become sunken and are covered by the dead bark. Cankers appear in winter and early spring, and cease extending when tree growth commences. However, the most serious effects of the attack may not be seen until summer when a dieback of leaders becomes evident, or limbs and sometimes entire trees begin to die off suddenly.

Control.—Many aspects of this disease are still being investigated, and the following recommendations must be regarded as tentative only. Where this disease is troublesome any necessary pruning should be done in the late summer months after harvesting. Spray with Bordeaux Mixture 15-15-100 plus half a gallon of white oil in early May, mid June and late July.

***Fig.* 3—Shot Hole of Cherry Leaf caused by** *Clasterosporium carpophilum.*
Note brown spots with reddish margin, and breaking away of spots from remainder of leaf tissue.

***Fig.* 5—Bacterial Canker.**
Note the bud gumming (*a*), and canker (*b*) which have resulted from infection through the bud.

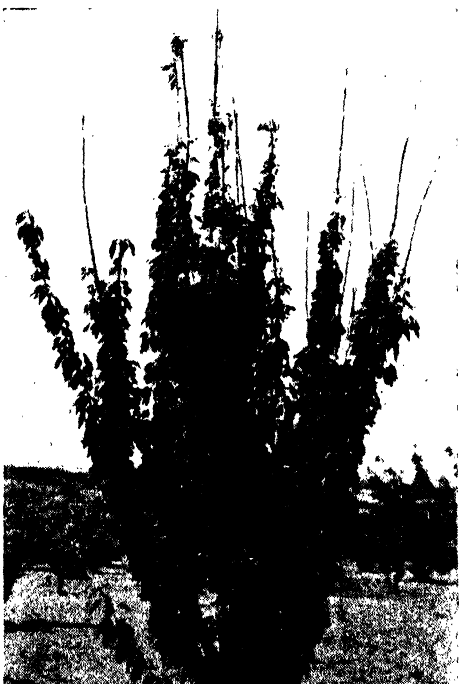


***Fig* 4—Bacterial Canker.**
This dieback of leaders is due to a canker on the trunk of the tree.

***Fig.* 6—Crown Gall.**
A severe case which has killed a young tree.

Fig. 7—Wood Rot.
The whitish outgrowths on the bark are the spore-bearing structures of the Heart Rot fungus (*Schizophyllum commu :e*). They are rather small, furry on the upper surface and the margins are fluted.

Crown Gall.

This bacterial disease, caused by *Agrobacterium tumefaciens*, is identified by the development of galls or rough outgrowths near the crown of the tree, or on the roots. The galls, which vary in size from that of a pea to more than a foot across, may be present on some older trees for many years without causing much apparent deterioration in health and productivity, except that infected trees will succumb more readily to adverse growing conditions. The disease is most serious on young trees, which can readily be girdled by the gall and killed outright.

Control.—Examine the young trees thoroughly for galls before planting, rejecting any tree with a gall. On established trees showing the disease, scrape away the soil to expose the gall, which should be cut off as completely as possible. Paint the cut surface with Bordeaux paint.*

When a tree is removed because of this disease, the hole should be left exposed during the summer and the soil treated with 2 to 3 lb. of sulphur. If it is possible, this hole should be avoided when a new tree is planted out.

Wood Rots.

Wood rotting fungi may gain entry to a tree through wounded tissue, such as sun scalded areas, pruning cuts and unprotected stumps of limbs, and having entered, can attack the heart wood, kill limbs and eventually destroy the entire tree. A long bark canker running along the length of the limb is produced, the bark dies, cracks and eventually peels off.

Control.—As any dead wood in the orchard helps the spread of wood rotting

*The formula for Bordeaux paint is: copper sulphate 1½ lb.; good quality hydrated lime 1½ lb. (or rock lime 1 lb.); water 2 gallons. The copper sulphate is dissolved in about one gallon of water, in a copper, earthenware, wooden or glass vessel; the lime is broken down with the remainder of the water and is poured into the bluestone solution to form the paint. The mixture should be freshly made up for use.

Fig. 8—Armillaria Root Rot.
Note the black, bootlace-like strands of the Armillaria fungus on the surface of the bark.

fungi, all infected or dead limbs should be removed and burned. Trim all wounds smooth, and paint large ones with Bordeaux paint or a bituminous paint.

Armillaria Root Rot.

This fungous disease, caused by *Armillaria mellea,* can produce a very serious root rot, the symptoms of which consist of a yellowing of the leaves and the appearance of black, bootlace-like strands on the surface of the bark of the roots. In advanced stages of the disease, gumming from around the crown and a canker moving up the trunk may be found.

Control.—It is most important that all stumps and old tree roots be removed from the soil during clearing.

In the early stages of attack, the soil should be removed to about 2 feet from the butt of the tree to expose the main roots. All diseased portions should be cut from the butt and roots, and the cut surfaces painted with Bordeaux paint and left exposed as long as is practicable. Trees in an advanced stage of the disease should be removed and burned, care being taken to trace out and destroy as many roots as possible.

Waterlogging.

Trees affected by periodic waterlogging show a premature yellowing of the lower leaves and a dieback of the lower laterals. A canker accompanied by gumming occurs in advanced stages, and decay of the main roots is evident.

Control.—See that the soil is adequately drained.

Sunscald.

Sunscald and subsequent invasion by fungi causing wood-rotting and dieback is of general occurrence in cherry trees of this State. Characteristically the sunscald effect appears as a lengthy, flattened strip of dead bark on the northern or north-western surfaces of limbs and trunks. These are the surfaces exposed to the heat of the afternoon sun.

Sunscald may occur to some extent in autumn when the foliage is thinning, in winter when foliage is absent, and in early spring before the trees have become adequately foliated. Summer sunscald can be reduced by careful pruning of the newly planted tree and by close attention to cultural management, thereby maintaining the trees in heavy foliage.

The larger the girth of a limb the sooner it is liable to sunscald. Consequently trees on Mazzard stock, which quickly develop to a greater girth than trees on Kentish stock, are more liable to sunscald, and that stock should, therefore, be avoided for the hot dry districts.

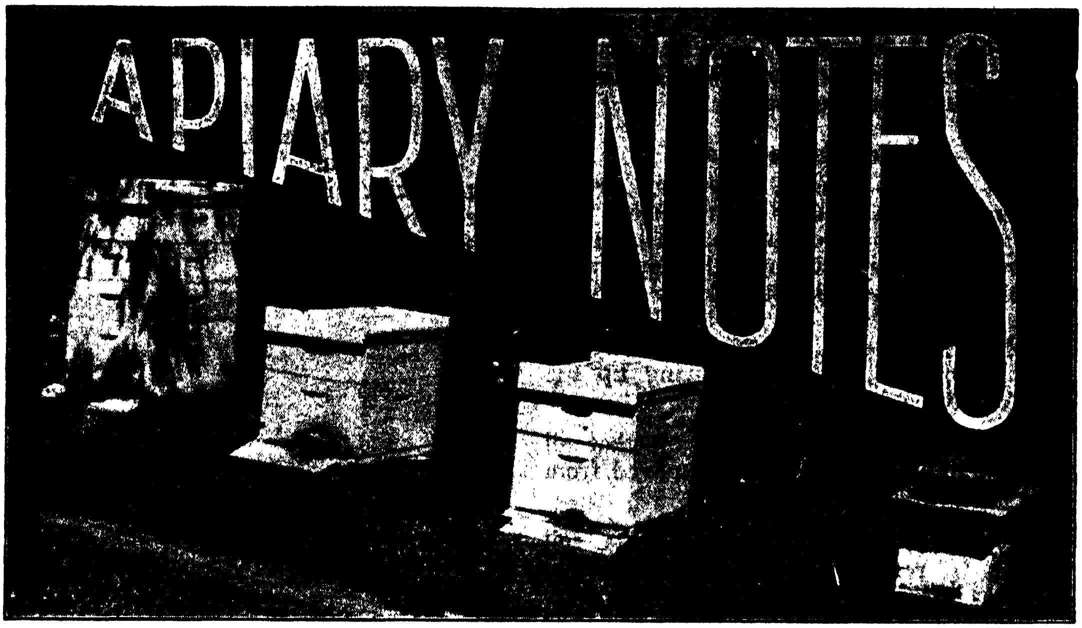
Fig. 9—Sunscald.
The bark has lifted and exposed the dead underlying wood, providing a place for ready entry of wood-rotting fungi.

Other Gumming and Decline.

Gumming occurs from causes other than those indicated above, such as from either excess or want of soil moisture, from intense heat, from heavy pruning, from Bordeaux mixture spray applied immediately after pruning, and from partial incompatibility of stock and scion. These troubles are not parasitic diseases, but indications of conditions unfavourable to the thrifty growth of the tree.

Where a branch is gumming and commencing to die back, inarching may give some relief. A suitable sucker at the root may be worked into the branch above the gummed area, just as in grafting. In a short

(*Continued on page 392.*)



THE GIANT TOAD (*Bufo marinus*)

An Enemy of Bees.

W. A. GOODACRE, Special Livestock Officer (Bees).

DURING the recent Conference of the Commercial Apiarists' Association, delegates expressed considerable anxiety concerning the risk of the natural migration of the giant toad (*Bufo marinus*) to New South Wales from Queensland, or of it being directly introduced, and it was decided to request the Commonwealth Government to take action to prevent the introduction of the toad to any other Australian State.

When full grown the toad is an ugly-looking creature, six to eight inches in length and usually four to five inches in breadth. The colour varies considerably, but is usually an irregular yellowish, reddish or blackish brown, darker on its back than on its underside.

Experience in Queensland.

During the discussion, Mr. E. Evans, a visiting representative of the Queensland Beekeepers' Association, gave an interesting address covering his investigations into the habits of this animal. He stated that, as an enemy of bees, the giant toad visited the hives toward nightfall and with the aid of its long tongue lapped up bees from about the hive entrance, consuming hundreds at one meal. The toads were not concerned about the possibility of being stung; in fact, they had been known to consume scorpions! On dissection of one of the toads, the stomach was found to contain about three hundred bees.

Because of this, said Mr. Evans, the Queensland Department of Agriculture and Stock had recommended that, to protect their colonies from the ravages of these animals where they occurred, Queensland bee-farmers should place their hives on stakes upwards of 2 feet high, or construct a wire-netting barrier around the apiary. This made conditions very difficult, particularly for the migratory bee-farmer; the manipulation of the hives on stakes was very troublesome.

The toad is a native of tropical America from Mexico to Argentine, whence it has been introduced to the islands of West

Indies and from there to the Hawaiian and Philippine Islands to control insect pests. It is of interest that in the *Agricultural Journal of Barbados,* 1939, it is stated that "where bees are attacked by the toads, the hives should be raised 2 feet from the ground."

Prolific Breeding Rate.

The giant toad was introduced to Queensland in the year 1935 for the purpose of controlling the greyback beetle, which in the grub stage cause damage to sugar cane; as a result of its prolific breeding habits, it soon became firmly established in the cane field areas of that State. Mr. J. R. Kinghorn, C.M.Z.S., writing in the *Australian Museum Magazine* of December, 1938, stated that: "In order to find out how frequently the toads produced eggs during the year, numbered arm-bands were placed on females which were definitely observed laying eggs. No. 1 produced 16,000 eggs on the 17th March, 1936, and was found depositing a further batch on the 30th May the same year, but as the egg strings were intertwined with that of eight other toads, a mass total of which was 125,000 eggs, the number per individual could not be estimated."

Introduction Opposed by Bee-farmers.

There was a good deal of opposition to the introduction of *Bufo marinus* by both bee-farmers and naturalists. Objections were that the animals would not confine their attentions to white grubs, and that they might migrate naturally outside the actual cane field areas. Mr. Evans, during his address at the Conference, made reference to the toads being found at higher elevations than was anticipated.

The toad can, when attacked by dogs and some natural enemies, emit a rather potent poison from glands situated behind its neck. This poison is fatal to domestic and other animals prone to attack the toad. Young toads do not appear to be poisonous and many are destroyed by birds, particularly by ibis, but the breeding is so prolific that the number destroyed in the early stages of growth appears to have little effect.

Efficiency in Beetle Destruction.

It is recognised by those engaged in the bee-farming industry that in any move to prevent the introduction of the giant toads the interests of cane growers must be considered, and this raises the question as to whether the toads are providing a full service in the destruction of the greyback beetle pest, or whether that pest could be controlled in the grub stage by the new insecticides now coming into use. This point was referred to in the Fortieth Annual Report of the Queensland Bureau of Sugar Experiment Stations, where it is stated: "It would appear that populations of the giant toad have now reached saturation point in many northern areas, and although some growers affirm that at least in localised areas the toad is coping with the grey-back beetle, in general it appears evident, both on the score of observations in the field and by virtue of the fact that grub damage has increased this year in areas where the toad population is high, that the number of beetles destroyed by the toad is relatively small when compared with the number that are nightly on the wing."

The Giant Toad.

[*After Kinghorn.*

The Starch Content of Sap-wood of Eucalypts As a Guide to Nectar Secretion.

A VERY interesting address was given at the Conference by Miss G. Wykes, M.Sc., of the Melbourne University, who was selected by the Council for Scientific and Industrial Research to carry out research in connection with the starch content in the sap-wood of eucalypts and its relation to honey flows. This research was undertaken following the promise given by investigations along similar lines commenced some years ago by the late Mr. R. G. McLachlan, a Victorian bee-keeper.

Victorian bee-farmers have co-operated with Miss Wykes in her research work, and so far it has been proved that a test of the starch content in the sap-wood is a reliable guide as to whether or not a species of *Eucalyptus* will secrete nectar in the flowers during its next flowering period.

The majority of our native eucalypts produce buds well ahead of the flowering period, and in the selection of sites for migratory work it is extremely important for the bee-farmer to have some useful guide as to whether the species of trees about the locality he intends to operate in, will produce nectar. The weather conditions at the time of flowering may have some influence on the quantity and quality of nectar produced, but the research work being carried out will relieve the bee-farmer of one of the very difficult problems with which he has been faced in the past.

In making the test for starch, a very small portion of bark on the trunk of the tree is removed and borings from the sap-wood (only a little being required) are secured. Drops of a weak solution of iodine are placed in the borings, and if a dark-blue colour results, it is proof of a heavy starch content. When no starch is present, the colour of the iodine will not deepen.

With a little practical experience the bee-farmer will be able to determine whether the starch content is high, medium or low, according to the change in colour. It is hoped that it will be possible to make up a colour chart for use as a guide.

Conference decided to request the C.S.I.R. to continue the research work and to include other species of flora in addition to eucalypts.

Other Influences on the Honey Flow.

We also have a good deal to learn in regard to soil moisture, types of soil, and climatic influences in relation to nectar secretion. For instance, we do not know why it is that during very dry seasons some of the heaviest crops of honey have been secured from such species as Grey Ironbark of the coast, and Yellow Box of the inland areas of this State. Maybe the subsoil in which these species thrive has something to do with it. On one occasion during the flowering of Grey Ironbark, the writer tested the subsoil and found it to be of a clayey nature, and though conditions had been extremely dry, the clay a foot or so down was damp enough to be moulded with the hands. Evidently this reservoir of moisture played an important part in the production of starch which was eventually turned into sugar to provide nectar for the flowers.

Careful observers have noted that a change in the weather, even without rain, has an influence on the quantity of nectar secreted by plants.

Effect of Limestone Country on Clover Honey.

Investigations in the United States of America, substantiated by our experience, go to prove that clover is not a reliable producer of honey in places where there is a deficiency of lime in the soil. Maybe this is the reason why the clover areas of our northern rivers are not so consistent for honey production as those of New Zealand and other countries where so much limestone country exists. New Zealand bee-keepers can usually depend on regular honey flows from clover.

An Interesting Observation on Coastal Ironbark.

In a recent review of the honey and pollen plants of the Erina Shire, between Woy Woy and Wyong, Mr. H. Cambourne has included the following reference to the Coastal Ironbark:—"This species is found within half a mile of salt water, and flowers during July and August every other year. The honey is of good quality and amber in colour. The species yields no honey on the

(*Contined on page* 392.)

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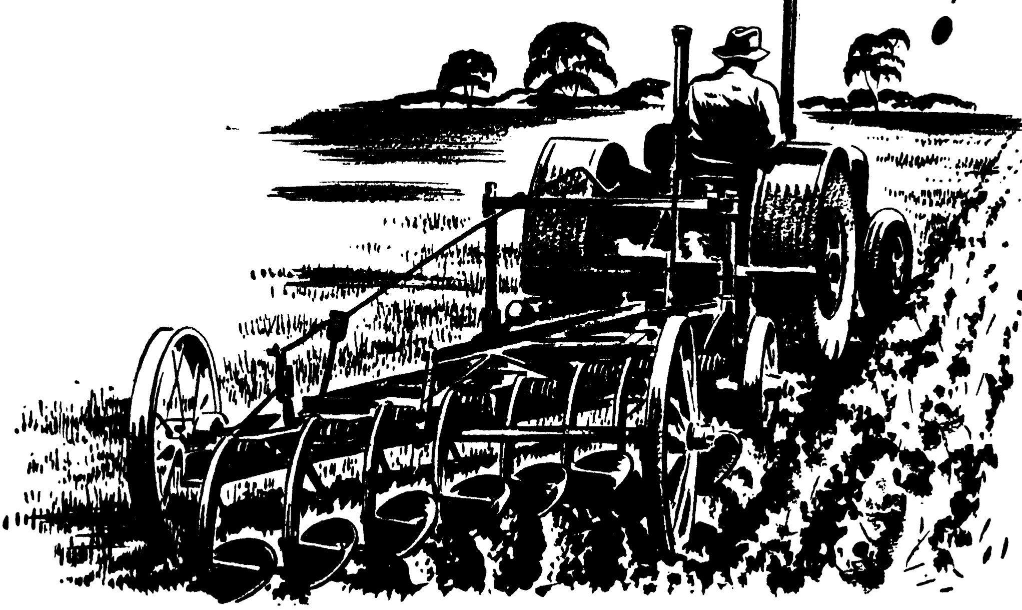

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The Use of—

FRUITS AND VEGETABLES IN THE HOME.

JUNE CHANCELLOR, Fruit Preserving Instructress.

Citrus Marmalades.

OF all the jams and jellies, marmalades are the most suitable for the breakfast table. They may also be used to advantage in cake fillings, sauces for puddings and as spreads for sandwiches, pikelets, scones and pancakes.

A good marmalade should be light-coloured, clear and sparkling in appearance with the peel and pulp suspended in the jelly.

The Fruit.

Marmalade is usually made from citrus fruits, because of the large proportion of pectin and acid present.

The Seville orange is popular, and lemons and grapefruit may be used either alone or in combination.

Choose fruit free from blemishes and just sufficiently ripe to have developed a good flavour and colour.

Preparation.

The fruit should be perfectly clean.

Unless marmalade is to be made from whole rings of fruit, it is easier to cut the peel finely after it has been removed from the fruit. Dipping the fruit in boiling water for a few minutes loosens the skin and makes its removal easier.

By slicing the peel very thinly a better extraction of pectin and acid is obtained. The white pith should not be cut away, as it contains a large proportion of the pectin or jellying ingredient. If marmalade without pith is desired, the pith should be cut up and tied, with the seeds, in a piece of muslin. This may then be boiled with the pulp and is easily removed just before the sugar is added.

Allowing the prepared fruit to stand in the necessary amount of water for some hours before cooking helps in the softening process and improves the flavour.

Cooking.

The fruit must be thoroughly cooked before the addition of the sugar. This is necessary to soften the peel and reduce the bulk, and usually takes 1½ to 2 hours.

The sugar is then added and the mixture boiled rapidly until jellying stage is reached. This should not take more than 20 to 30 minutes.

Avoid long cooking after the addition of the sugar, as the colour becomes dark and the flavour is spoilt. Long cooking may also affect the jellying properties and cause the marmalade to be syrupy.

When the cooking is complete, allow the marmalade to cool slightly and stir gently before pouring into warm, dry jars. This prevents the peel rising to the top of the jar, which is the tendency if bottled at once.

Shredding the Rind.

[*After Elizabeth Craig.*

Quantities.

The proportion of ingredients varies according to the mixture of fruit being used. As a general rule, however, 3 pints of water is added to each pint of fruit. This mixture is cooked thoroughly and then measured, allowing equal measure of sugar.

Some Recipes to Try.

Lemonade Marmalade.—

1. Allow 1 orange to each 6 lemons.

2. Slice the fruit very finely with a sharp knife.

Pouring into Hot Jars.
[After Elizabeth Craig.

3. Measure, and to each pint of fruit allow 3 pints of water.

4. Cover and allow to stand overnight.

5. Next day boil rapidly until the fruit is quite tender.

6. Measure, and add cup for cup of sugar.

7. Heat slowly to boiling point, then boil rapidly until it jells when tested.

8. Cool slightly and pour into heated jars.

9. Seal when cold.

Orange Marmalade.—

1.—Use 6 Seville oranges, 3 lemons and 3 sweet oranges.

2.—Wash fruit and slice finely, removing seeds.

3.—To each pound of fruit add 1 quart water and stand overnight.

4.—Boil until quite tender (1½ to 2 hours).

5.—Weigh and add 1 lb. of sugar to each 1 lb. of pulp.

6.—Boil until jellying stage is reached.

7.—Cool slightly and pour into dry, heated jars.

8.—Seal when cold.

Butter for United Kingdom.

Proprietary Brands to be Permitted.

THE British Minister for Food has announced that, as from 1st October, 1947, it is intended to withdraw present regulations prohibiting the use of proprietary brands on Australian butter marketed in the United Kingdom.

Existing requirements to mark butter wrappers with the words "NATIONAL BUTTER" will be retained, but from the date specified wrappers may also bear proprietary brands, indicating packers, quality and country of origin.

Advice to this effect has been received by the Minister for Agriculture (Mr. Graham) from the Agent-General in London.

Mr. Graham said that he was anxious that all sections of the trade be given early notice of the proposed change. Revocation of regulations prohibiting the use of markings on butter wrappers of details descriptive of place of origin and quality of butter would permit resumption of the pre-war practice of retailing various brands of butter exported to the United Kingdom under proprietary brands, thus giving packers of such butter an opportunity to regain some of the goodwill developed prior to but lost during the war for their particular brands.

The Making of Silage—*continued from page* 368.

Silage for Dry Cows.

There is a tendency to allow dry stock to fend for themselves in the matter of feed. They should, however, receive a ration containing sufficient nutrients; the effect on the body condition and, later, milk yield, of the animal is quite obvious where feeding of dry stock is practised. A suitable ration is: 25 lb. silage, 8 lb. lucerne chaff or hay, 3 lb. of crushed oats.

INSECT PESTS.

Notes contributed by the Entomological branch

Ladybird Beetles (*Coccinellidae*).

WITH the exception of one injurious group, viz., the leaf-eating ladybirds belonging to the genus *Epilachna*, practically all the members of this family—which, in Australia, contains more than 250 different species—are beneficial insects. In both the larval and adult stages they feed upon and destroy aphids, scale insects, mealy-bugs, etc. The life histories of the various species are, in general, very similar to each other.

The Eighteen-spotted Ladybird (*Leis conformis*).

This ladybird, which is probably the most numerous species, is widely distributed. It is to be found throughout the greater part of the year, in gardens where, in both its larval and adult stages, it feeds on aphids. It is often found on native plants that are infested with small psyllids.

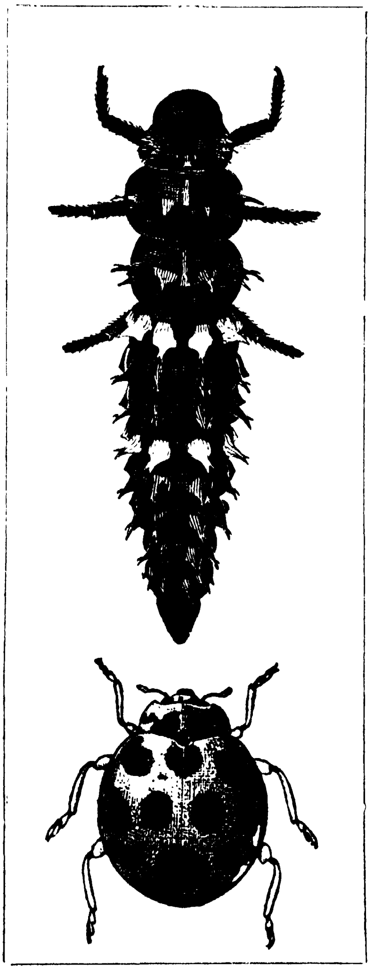
At times, this ladybird becomes particularly numerous, and in some districts, following upon early and severe infestations of green peach aphids, the trunks and main limbs of the trees may become densely covered with the pupae of this species.

Life History.—The yellow, spindle-shaped eggs are laid upright in small groups on the leaves or bark of aphid-infested plants. The active, elongate larvae vary from dark-grey to black, with orange markings. When fully-fed, the larva, which may then measure about ⅓-inch in length, attaches itself by the tip of the abdomen to a leaf or bark of the plant. Later the last larval skin splits and the larva passes into the resting pupal or chrysalis stage.

The adult ladybird, which may measure up to ¼-inch in length, is bright, glossy, orange-yellow in colour, and is marked, usually, with eighteen black spots. These markings, however, vary from sixteen to twenty in number.

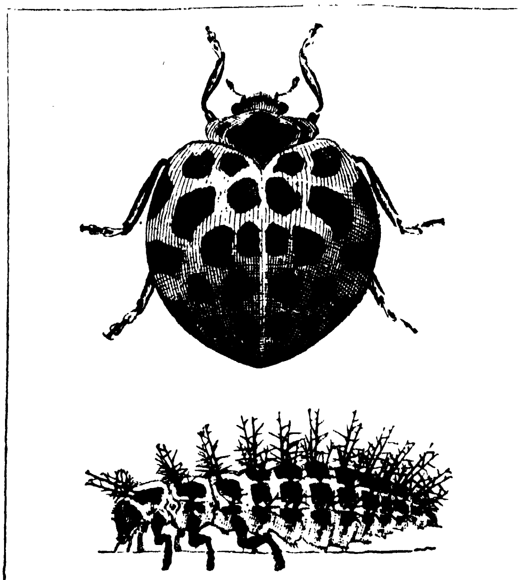
Several generations occur during the year.

This useful ladybird is sometimes mistakenly thought to be the common, injurious, leaf-eating, or "twenty-eight-spot-



The 18-spotted Ladybird and its Larva.

ted" ladybird (*Epilachna 28-punctata*) which, in both its larval and adult stages, skeletonizes the foliage of various solanaceous and cucurbitaceous plants, such as potatoes and pumpkins. Where aphids



Adult and Spiny Larva of the Leaf-eating or 28-spotted Ladybird.

are present on such plants, it is not uncommon to find the larvae and adults of both ladybirds present.

The wing-covers of the leaf-eating ladybird are not as glossy as those of the beneficial species, and have a somewhat downy appearance. Its larvae are readily distinguished from those of the beneficial species, as they are yellowish, and their bodies are covered with numbers of black, branching spines.

The Steel-blue Ladybirds (*Orcus* spp.).

The two most frequently observed species of steel-blue ladybirds are the six-spotted ladybird (*Orcus australasiae*) and the blue ladybird (*O. chalybaeus*), both of which, in their larval and adult stages, feed upon and destroy scale insects.

The six-spotted ladybird, which measures about one-fifth inch in length, is of a general bright, steel-blue colour, with six, rounded, orange-coloured spots on the wing covers. This ladybird, in addition to feeding on scale insects, has also been found feeding on the woolly aphid (*Eriosoma lanigerum*).

The blue ladybird is a smaller species which measures about ⅛-inch in length, and is of a uniform, bright metallic steel-blue colour.

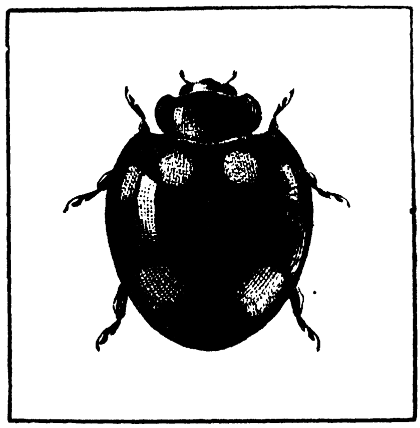
Another larger species, the two-spotted ladybird (*O. bilunulatus*) is also found on scale-infested trees. It is steel-blue, and has two orange-coloured spots on the wing covers.

Ladybirds which Destroy Mealy-bugs.

Numbers of ladybirds feed upon mealy-bugs, and amongst these may be mentioned *Cryptolaemus montrouzieri* and *Rodolia cardinalis*.

The former species in both its larval and adult stages feeds upon and destroys various species of mealy-bugs, including the pine tree mealy-bug (*Pseudococcus aurilanatus*) and the long-tailed mealy-bug (*P. adonidum*), and other mealy-bugs which are pests of many different kinds of plants. It has also been recorded feeding on the common gum tree scale (*Eriococcus coriaceus*).

The adult, which measures about one-seventh-inch in length, is black, with the head and front portion of the body, the tips of the wing-covers and the abdomen reddish.



The 6-spotted Steel-blue Ladybird.

The small, oval eggs are yellowish in colour, and are usually laid singly on the cottony egg-sac of the mealy-bug, or close to groups of the mealy-bugs.

The larvae, which measure about ⅓-inch in length when fully-fed, are yellowish, but are entirely covered with white, waxy or mealy substance, and bear long, white filaments, so that they are often mistaken for

large mealy-bugs which they superficially resemble. The filaments, however, are arranged differently, and they are much more active insects than their prey.

The larvae are considered to be more important than the adults in destroying mealy-bugs, and as mealy-bugs are not readily controlled with ordinary insecticides, owing to their protective mealy covering, and the fact that they often infest delicate plants, this ladybird predator is, therefore, of particular value in reducing the numbers of these insects.

Various countries have attempted to introduce this ladybird, and as far back as 1892 it was successfully and widely established in California, where it fed particularly on various mealy-bugs infesting citrus trees.

The adult of the second species of mealy-bug-feeding ladybird, *Rodolia cardinalis*, is of variable size, but may measure up to ⅛-inch in length. It is usually red with black markings. In the females the red predominates.

The small, red eggs are laid singly, or in little masses, on the egg-sac of the cottony cushion or fluted scale (*Icerya purchasi*), and the young larvae on hatching enter the sac where they feed on the eggs and young mealy-bugs. The larva, which may measure about ¼-inch in length when fully-fed, is orange-red with black markings, but is frequently covered with a greyish, powdery substance. The pupal stage is passed on the plant.

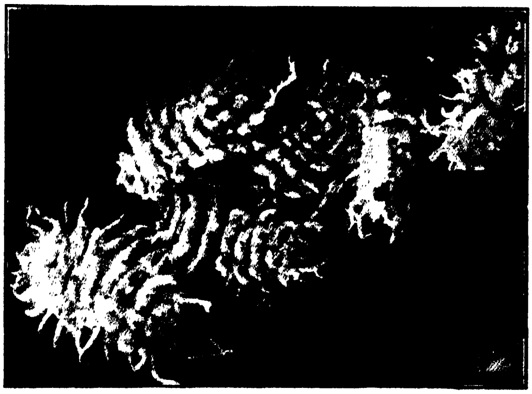
This ladybird has also been successfully introduced into various countries to control the cottony cushion scale, which is a mealy-bug. .

Other Beneficial Species of Ladybirds.

Many other ladybird beetles attack various scale insects and aphids, and amongst these are numbers of yellow and black species of moderate size, and others that are brown, black or with indistinct markings. Many species such as those which feed on small mites and red spiders, are extremely small and may only measure about 1/25-inch in length. Unless searched for, these small forms usually pass unnoticed.

A Fungus-eating Ladybird (*Leptothea* (*Halyzia*) *galbula*).

In this State there is at least one species of ladybird that feeds on the spores of mildews (*Oidium* sp.) which develop on many kinds of plants.



Ladybird Larvae which Destroy the Pine-tree Mealy Bug.
[*After Smith and Armitage.*

The adult, which measures about one-sixth inch in length, is lemon-yellow, with black markings. The black areas extend mainly across the centre and base of the wing-covers and are connected by a narrower median line.

This species often occurs in considerable numbers, and although the ladybirds may reduce the number of spores present on the leaves of any particular plant, it is quite possible they may also be responsible for spreading the fungus by flying from plant to plant.

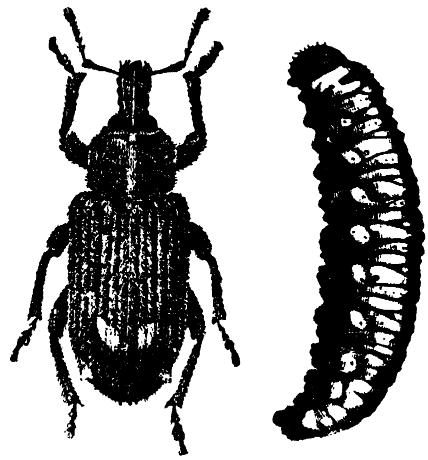
The Vegetable Weevil (*Listroderes obliquus*).

DURING this period of the year the larvae or grubs of the vegetable weevil—which usually make their first appearance about three to four weeks after the beginning of the autumn rains —are very numerous.

These larvae, which, when fully-fed, measure up to ½-inch in length, are stout-bodied, legless grubs and vary in colour from pale green to yellow.

The grubs feed mainly at night and hide by day in the soil or under rubbish about the base of the plants. They infest mainly the undersurfaces of the leaves or the crowns of the plants. After feeding for

about four to six weeks they become fully-fed and make their way into the soil where they construct small, earthen, pupal cells at a depth of from one to three inches below the surface, in which they pass their pupal or chrysalis stage. The adult weevils, which develop from these pupae, usually commence to emerge from the soil in the spring—from about August onwards.



Adult and Larva of the Vegetable Weevil.

The adult weevil, which measures about ⅓-inch in length, is of a grey-brown colour, and has its head produced into a snout, at the extremity of which are the jaws.

The adults feed voraciously at night and hide in the soil by day. They are most numerous during October and November, but by the end of the latter month they make their way down into the soil where they remain inactive during the summer. When the cooler autumn weather commences they emerge and begin to lay their eggs, either on the soil about the bases of the plants, or on the crowns of the plants. Egg-laying continues throughout the winter, and the incubation period varies from two to four weeks.

This pest attacks many varieties of vegetables and both larvae and adults may cause serious damage to crops. Amongst the cultivated plants frequently injured are beetroot, carrot, lettuce, parsnip, potato, radish, tomato, turnip, etc. In addition, they also feed upon various weeds, in particular on marshmallow (*Malva* sp.) and Cape weed (*Cryptostemma calendulaceum*).

The foliage of the plants may have large irregular pieces eaten out, and the new leaf-growth of the crowns may be eaten away as it develops. Where the infestation is severe even the stalks may be devoured. Root crops such as carrots, parsnips, turnips, etc., may be attacked below the ground level and destroyed.

The weevils do not attack peas, beans, pumpkins, etc., or oats, wheat and barley.

Control.

Clean cultivation is an important factor in the control of this pest, as the weevils and their larvae also feed upon numbers of weeds. It must be remembered, however, that the destruction of weeds, late in the season, may cause the weevils to migrate into adjacent cultivated areas. As a precautionary measure, therefore, any ground that has been cleared should be baited after an interval of several days either with poisoned foliage or poisoned bran mash.

For baiting, the chopped leaves of Cape weed, marshmallow, waste lettuce or turnip, etc., which have been either sprayed or dusted with arsenate of lead, may be scattered over the ground late in the afternoon.

The formula for the poison bran bait is as follows:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gals.

The bran and Paris green should be thoroughly mixed together first, and then made into a crumbly mash with the water in which the salt has been dissolved. This bait may be lightly broadcast over the area, or partly worked into the soil, preferably in the late afternoon.

With crops such as potatoes, carrots, etc., *the foliage of which is not used as food,* control of this pest may be obtained either by spraying or dusting the plants with arsenate of lead.

The Spray.

Lead arsenate powder ..	4 oz.
Water	5 gals.

The Dust.

Lead arsenate powder ..	1 lb.
Kaolin	4 lb.

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

Concentrates, Prices and Protein

In Milk Production.

ALTHOUGH the present general shortage of all types of concentrates makes any reference to concentrate feeding seem rather out of place, it is generally recognised that the shortage will be largely overcome by one or two good harvests. This year's harvest might even result in substantial quantities of stock feed grain being made available, and even the present limited supplies should be used to best advantage.

The amount of concentrates which should be fed to dairy cattle to produce the maximum amount of profit is not a fixed and stable quantity. It depends on several factors, viz.:—

1. The cost of the concentrates landed on the farm.

2. The price for milk or butter-fat.

3. The amount of roughage being received by the cow, *i.e.*, whether only limited amounts are being fed, or whether the cow is obtaining as much as it wants.

4. Production of the individual cow. As this varies throughout the lactation of the cow, the most profitable level of concentrate feeding will continually alter.

The varying relationship of these four factors might make it appear that the determination of the most profitable rate of concentrate feeding is rather an involved affair. In point of fact, however, it has been possible to reduce it to a simple table, this being largely the result of work carried out in the United States and checked to a certain degree by local research work.

Profitable Rates of Concentrate Feeding.

Table I gives the most profitable rates of concentrate feeding when the cows are obtaining a full feed of roughage such as pasture, maize or sorghum silage, etc.—as should be the case in coastal dairy herds. With concentrate mixtures costing between £8 and £9 per ton for instance, and with butter-fat at about 1s. 6d. per lb., it pays to feed 1½ lb. of concentrates for each gallon of milk produced by each cow. This means feeding each cow according to her production, which means production recording.

Enrolment in an official herd recording scheme or checking of production once every few weeks will give a sufficiently accurate level for the concentrate feeding. Some farmers, who have realised the soundness and profit in individual feeding of concentrates, keep a blackboard on the dairy wall with the production and concentrate allowance per cow chalked on it. Alternatively, cattle can be divided into groups producing, say, 20 lb., 30 lb. and 40 lb. of milk, which are milked in this order, and are fed different amounts of concentrates.

There is no need to weigh each feed. Sufficient accuracy can be obtained by using containers of different size for different weights of feed, or by using a container with marks at, say, 2 lb., 4 lb. and 6 lb. levels. Always check the accuracy of containers when the concentrate mixture is changed or when a new batch of feed is bought. If feeding bails are not available a small box on the bail door is a good makeshift.

Relation of Concentrates to Roughage.

The composition of the concentrates must depend on the type of roughage. Low protein roughages, such as mature pasture, sorghum or maize silage, chaffed cowcane, or cereal chaff, need high protein mixtures such as mixtures of linseed meal, peanut meal or meat meal with crushed grain, while high protein roughages such as leafy

TABLE I.

Concentrate Rates with Plentiful Roughage.

Cost of Concentrates per short ton, 2,000 lb.	Milk or Butter Fat Price.	Feed Concentrates at this Rate per day.
Up to £6......	1s. 6d. per lb. butter fat (approx. 9d. per gallon for milk).	3 lb. per gallon (1 lb. to 3 lb. of milk).
£6–£7	,, ,, ...	2½ lb. per gallon (1 lb. of concentrates to 4 lb. of milk).
£7–£8	,, ,, ...	2 lb. per gallon (1 lb. of concentrates to 5 lb. of milk).
£8–£9	,, ,, ...	1½ lb. per gallon (1 lb. of concentrates to 6 lb. of milk).
£9–£10	,, ,, ...	1 lb. per gallon (1 lb. of concentrates to 10 lb. of milk).
£10–£11	,, ,, ...	½ lb. per gallon (1 lb. of concentrates to 20 lb. of milk).
Over £11 ...	,, ,, ...	It does not pay to feed concentrates at this price.
Up to £11 ...	1s. 6d. or more per gallon for milk.	5 lb. per gallon (1 lb. of concentrates to 2 lb. of milk).
Over £11 ...	,, ,, ...	4 lb. per gallon (1 lb. of concentrates to 2½ lb. of milk).

Note—These recommendations apply to 4 per cent. fat content milk. For milk of lower or higher fat content, the level of concentrate feeding should be slightly lowered or raised respectively.

pastures, young oat grazing, lucerne hay and clover hay need only low protein concentrates such as crushed grains.

With all protein concentrates in short supply, every endeavour must be made to supply the protein requirements of the cattle by the roughage.

Low protein roughages supplemented with low protein concentrates mean that the feed goes into condition on the cows—not into milk. Good conditioned cattle and low milk production spell protein deficiency.

Suitable concentrate mixtures are as follow:—

For feeding with a good quantity of protein-rich grazing, or lucerne hay (over 10 lb. per day)—

Crushed grains such as oats, wheat, barley, maize or grain sorghum.

For feeding with poor pasture, maize or sorghum silage or green fodder, but with some lucerne hay or oat grazing—

Mixtures with 16 per cent. Protein.

Crushed grain .. .. 70 lb.
Linseed meal .. .. 30 lb.

or

Crushed grain .. .. 85 lb.
Peanut meal .. .. 15 lb.

or

Crushed grain .. .. 85 lb.
Meat meal .. .. 15 lb.

Where some mill offals are available the amount of protein concentrate can be reduced.

For feeding with all low protein roughages (i.e., mature (seeding or seeded) pasture, maize or sorghum silage, cereal chaff, etc., and no lucerne, clover, oat grazing, etc.)—

Mixtures with 20 per cent. Protein.

Crushed grain .. .. 50 lb.
Linseed meal .. .. 50 lb.

(This mixture may be unpalatable if fed in large amounts.)

or

Crushed grain .. .. 75 lb.
Peanut meal .. .. 25 lb.

or

Crushed grain .. .. 75 lb.
Meat meal .. .. 25 lb.

or

Crushed grain .. .. 30 lb.
Mill offals .. .. 30 lb.
Linseed meal .. .. 40 lb.

Further information on feeding according to production and rates of concentrate feeding can be obtained from the Departmental pamphlet, "Feeding for Milk Production," obtainable on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

TRAIN SERVICE REDUCTIONS

•

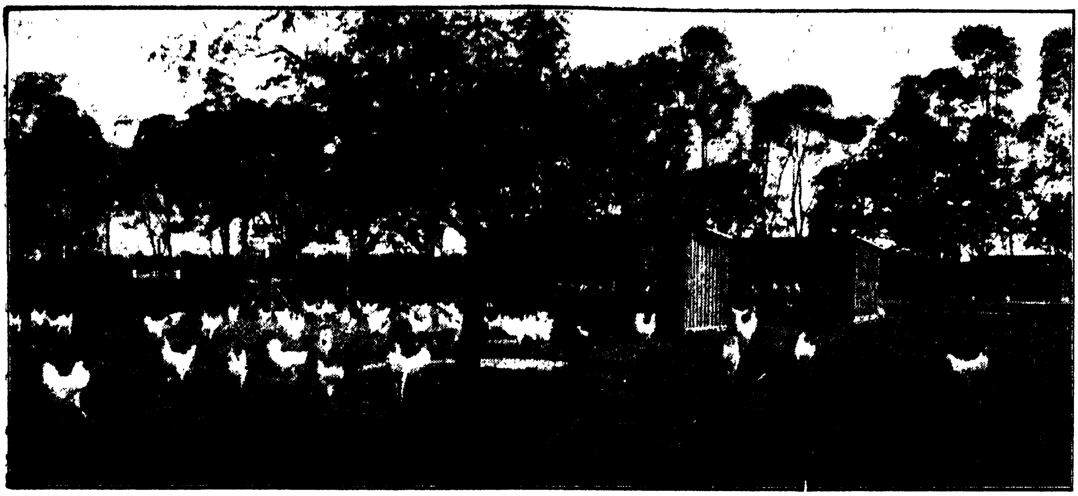
Owing to its inability to obtain adequate supplies of coal the Department of Railways has been forced to reduce its train services for the second time in the last twelve months.

It is most disappointing that such action has been found necessary. The Department has been steadily building up its standards of service since the war ended. It has been confidently anticipating the introduction of further improvements in the near future. But, owing to influences over which the Department has no control, sufficient supplies of coal are not being received to maintain the normal services.

Every endeavour has been made to make the best of an unfortunate set of circumstances. Passenger and goods train services have been re-arranged to effect the necessary reduction in coal consumption and, at the same time, to cause as little inconvenience as possible. Nevertheless some inconvenience, and possibly a certain amount of hardship, is unavoidable when train services are reduced.

While regretting the reductions the Department earnestly requests your co-operation until normal train services can be restored. Railwaymen will be helped if you keep in mind that they are trying to help you.

S. R. NICHOLAS,
Secretary for Railways.



Poultry Notes.

July, 1947.

E. HADLINGTON, Principal Livestock Officer (Poultry).

The Cost of Producing Eggs

In New South Wales.

DURING the past few years the estimated cost of producing eggs on a "one-man" farm of 1,000 layers has been given in these Notes, and the figures have been accepted by industry associations as being soundly based. No attempt has been made to estimate the costs on larger farms on account of the wide variation in conditions existing on such farms.

The estimated costs for the year 1946-47 are quoted this month together with the gross price paid to producers, enabling an estimate of the return to poultry farmers.

The figures given below are based upon a 5-acre farm conducted for producing eggs as a main source of revenue, but allowance is made for the sale of hens which, under present conditions, just about covers the cost of rearing the pullets to productive age; thus no charge is made for rearing chickens and no credit is shown for the income for sale of hens. The estimated costs for the year 1946-47, on this basis, are as follow:

Estimated Costs for Year 1946-47.

	£	s.	d.
Interest on land (5 acres at £60 per acre) at 5 per cent.	15	0	0
Interest on buildings and plant (£800) at 5 per cent.	40	0	0
Depreciation on buildings and plant (£800) at 3 per cent.	24	0	0
Maintenance costs	25	0	0
Cost of feeding 1,000 layers at 11/- ..	550	0	0
Purchase of 750 pullet chicks at £6/15/- per 100	50	12	6
Municipal or Shire rates, water rates and excess water	25	0	0
Incidental expenses, vaccination, etc. .	15	0	0
Labour allowance	413	0	0
Marketing costs (freight or cartage, control fund deductions, handling charges)	181	5	0
Cost of producing 12,000 doz. eggs	£1,338	17	6
Cost per dozen	2s. 2.77d.		

The cost of 2s. 2.77d. shows an increase over the 2s. 0.29d. last year.

The gross price paid to producers was approximately 1s. 8¼d., compared with 1s. 8d. in the previous year. The main item contributing to the increased cost was

feeding, which soared from 9s. in 1945-46 to 11s. per hen over the year ending 30th June, 1947.

The Remuneration to the Farmer.

The figures show a loss of 6½d. per dozen, as compared with 4¼d. per dozen last year, or £312 10s. 0d. over the twelve months—which reduces the farmer's remuneration to £100 10s. instead of £413 allowed in the estimated costs. Of course, where eggs are sold privately under permit, the income would be higher, and also in cases where production exceeds the 12 dozen per hen per year as allowed in the estimate.

The reasons for the rise in feeding costs are that there has been an increase in the price of wheat and wheatmeal, and, on account of the shortage of wheat and mill offals, poultry farmers have been forced to use more costly ready-mixed mashes as well as wheatmeal and grain sorghum meal to maintain their flocks.

The labour item of £413 is the same as last year, and is made up of an allowance of £6 10s. per week for the farmer and £75 to cover week-end relief or assistance in case of sickness and during holidays.

It will be noted that no amount is shown for the rent of the dwelling, which, it is considered, would be offset by interest and other charges.

While the position of the small egg producer as disclosed by these figures, is not encouraging, there should be some improvement during the ensuing twelve months, due to the increase of 5d. per dozen in the price of eggs in shell to be exported to Britain, and, in the event of a good harvest, the feed situation should ease somewhat.

Better Quality Eggs for Export.

IN a few weeks the export season will be in full swing and in view of the ban placed on washed eggs for export it behoves every producer to do everything possible to keep eggs clean, so that the export target of thirty million dozens may be reached.

The increase of 5d. per dozen on eggs for export, if passed on to the producer, should be an incentive to adopt measures designed to increase the proportion of eggs suitable for export.

Those who have relatives in Britain will realise how desperately eggs are required to supplement the meagre and monotonous diet of the people, but should any evidence be required to show how much farm products are required it will be found in an appreciative letter from a consumer in England, in the "Weekly Egg and Poultry Market Report" published by the Canadian Department of Agriculture. It reads as follows:—

Birmingham, England,
March 17, 1947.

Dear Sir.—

This is just a letter to thank you and your agricultural workers for the beautiful chickens and eggs you are sending to England.

"The eggs are so perfect when we get them that we are able to boil them, and they are as fresh as if they had only been laid a day or so.

"The chickens are a godsend to housewives with men to feed, as the meat and cheese ration goes nowhere.

"I am just one of the thousands of English housewives who has a man (my brother) to cut sandwiches for each day, as his breakfast is at 6 o'clock each morning. The breakfast he gets is not enough; it is only half a slice of bacon (very small) and two potatoes, if possible, bread, marmalade and tea.

"I go to work with only a cup of tea and two pieces of toast.

"Good luck to you all,

Yours faithfully,

L — N — "

The letter also shows the high quality of Canadian eggs, and an appeal to producers appearing in another issue of the same publication indicates the efforts being made to encourage Canadian producers to keep up the quality of their eggs. This is quoted on next page.

RE-GRADING COSTS $200 A CAR.
Added Expense the Poultry Industry Cannot Afford.

There is one standard only for grading Canadian eggs, whether for domestic or export use.

Eggs, when first graded, should be graded sufficiently well to pass through ordinary channels of trade without necessity of re-grading.

Winter eggs are comparatively easy to grade.

Spring eggs present problems, the result of changed production conditions.

Birds running out, warmer weather, scarcity of feed, extra farm work—all affect quality.

Each authorised egg grader has a duty to perform.

A duty to protect export contracts and domestic demand.

Repeat orders depend largely upon the exactness of the original grading.

CANADIAN EGG GRADERS—
HAVE PRIDE IN YOUR WORK!
A JOB ONCE DONE—WELL DONE"

Although the method of handling eggs in Canada is different from ours the main point emphasised is the importance of quality, and it is quality which is of such vital importance to our industry to-day. Quality, both for home consumption and for export, is the keynote of the future success of the poultry industry in this country, and this aspect must be given more consideration by producers and marketing authorities alike.

TO MAINTAIN QUALITY ON THE FARM.

The more important points in management to which the poultry farmer should give attention in order to ensure quality and cleanliness of eggs are listed hereunder:

1.—See that the nests are kept clean and dry, and have adequate nesting material to prevent breakages.

2.—Collect the eggs at least twice daily, and do not allow them to stand in the heat during hot weather, or in the rain on wet days.

3.—In the warm weather, place the eggs in the coolest room available, and allow them to cool before packing. The room should not be draughty, yet should be free from strong odours.

4.—When packing, place all eggs large end upwards, and do not wedge any large

A Section of the New South Wales Egg Marketing Board's Sydney Floor.
Eggs being packed for export.

Australian Eggs being Unloaded in England.

eggs in the fillers. Also see that sufficient padding is used on both bottom and top to prevent breakages.

5.—Pack separately all eggs considered clean enough to export and do not include any washed eggs in the pack. Mark them clearly "for export."

6.—Keep the houses reasonably clean and use litter on the floors of all houses whether they are semi-intensive, intensive or roosting sheds. This will assist in keeping eggs clean.

7.—Keep broody hens off the nests.

8.—Market the eggs at least twice a week.

9.—Remove all male birds as soon as the breeding season is over, as fertile eggs deteriorate more rapidly in warm weather than infertile eggs.

D.D.T. as an Anti-Ked Dipping Agent.

G. J. SHANAHAN, B.Sc.Agr., Assistant Entomologist.

SINCE woolgrowers may be contemplating using D.D.T. for the control of the sheep ked (*Melophagus ovinus*) this season it is felt that some remarks concerning the effectiveness of D.D.T. against this parasite may be of interest.

Departmental field trials with both plunge and spray dips have shown that D.D.T. is toxic to keds at relatively low concentrations. In a trial at Blandford, it was established that wool on sheep which had been treated with 0.05 per cent. active D.D.T. in a power spray dip remained toxic to keds for at least four weeks[1]. Since the majority of keds hatch from pupae within twenty-eight days of deposition[2], the chances of keds surviving are remote when sheep are treated with D.D.T. preparations containing at least 0.05 per cent. active D.D.T.

Chemical analyses were made of the dipping samples which were taken during the progress of the spraying trial at Blandford, and it was found that there was a decrease in the D.D.T. content of the spray bath during the course of the treatment. In order to ascertain further information on the rate at which the D.D.T. is lost from dip fluids, experiments were arranged at Young, Coolah and Mendooran.

D.D.T. Content Must be Maintained.

Briefly, chemical analyses of dipping samples taken during these experiments indicated that when sheep are dipped in 0.1 per cent. active D.D.T. preparations within six to seven weeks from shearing, the D.D.T. concentration of the bath falls to 0.05 per cent. after about 500 sheep have been either dipped or sprayed. This means that on each occasion after this number of sheep have been treated in either the plunge dip or power spray, it is essential to add sufficient D.D.T. to the dip fluid to restore the D.D.T. content of the bath or reservoir to 0.1 per cent. of active D.D.T. Where it is desired to replenish the dip, it is necessary to add sufficient D.D.T. to bring the D.D.T. content of the total fluid up to 0.1 per cent. When this procedure is followed the D.D.T. content of the bath will remain above 0.05 per cent. concentration at all stages during dipping.

In dipping or spraying sheep, any long wool under the neck or brisket, where adult pupae and keds are commonly found on infested sheep, is not always saturated. Notwithstanding this, in an experiment at Young, keds were controlled with D.D.T. on rams, the long wool of which, in the region of the neck, was incompletely wetted at treatment. In this trial, which was conducted on E. & N. Campbell's property, 100

Sheep Ked ("Tick") (*Melophagus ovinus*)
Engorged female, enlarged. (From Imes, 1917.)

ked-infested rams were treated six weeks off shears in a power spray dip at 0.1 per cent. of active D.D.T. No live keds or viable pupae could be found seven weeks following treatment. The rams were carrying 1 to 1½ inches of wool underneath the neck and brisket when sprayed, and the ked population on each ram was conservatively estimated as thirty adult keds and fifty pupae. It is apparent that the keds present at the

(*Continued on page* 392.)

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingah.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingah State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	51
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	46
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn	65
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Martin Bros., "Narooma," Urana-road, Wagga (Jerseys)	127
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
New England Experiment Farm, Glen Innes (Jerseys)	49
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forrest (Aberdeen-Angus)	24
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H. "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	9
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, F. J., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	152
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	110
Yanco Agricultural High School	64
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
New England University College, Armidale	25
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo	62
State Penitentiary, Long Bay	14
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong ...	100	30/8/47
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Campbell, L. W., "Dunmallard," Fern Hill Road, Inverell (Jerseys)	39	21/7/47
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixson, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Martin, W. W., "Narooma," Urana Road, Wagga (Jerseys)	127	14/9/48
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	259	20/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37	5/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station	19	29/4/47
Weatherlake, J., "Bransome," Camden ...	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	119	20/4/48
Yanco Agricultural High School, Yanco ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Barnardo Farm School, Mowbray Park ...	53	18/7/47
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brodie, A. D., Naman Park, Menangle ...	49	14/4/48
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
De Fraine, A. N., Reservoir Hill, Inverell ...	21	8/6/47
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	7	27/6/47
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Warialda Road, Inverell	53	10/4/47
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	41	26/6/47
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	62	26/7/47
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	24	23/5/47
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
New England University College, Armidale ...	25	18/4/49
O'Brien, O. "Mount View," Inverell .	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
Reid, G. T., "Narrengullen," Yass	275	15/7/48
Richardson, C. E. D., Kayuga Road, Muswellbrook	78	3/7/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's College, Armidale	11	20/2/47
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Weatherlake, J., "Bransome," Camden ...	7	14/3/48
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	52	10/6/48
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Plant Diseases—*continued from page 373.*

while a perfect union is effected, the branch picks up and within three or four months is manifestly more vigorous and healthy. Many trees have been saved by this means. In certain instances it is sufficient to make use of a shoot in the main trunk below the gummed area by turning it into the branch above the injury, or where there are no suitable suckers below the gummed areas, a healthy one may be selected from elsewhere and planted under the tree. When it is apparent that the sucker has taken root it may be cut back and inarched into the tree.

Many trees have been observed after such treatment and they are continuing to crop satisfactorily and have justified all the work involved.

Apiary Notes—*continued from page 376.*

southern side of Brisbane Water—only on the northern side is it useful."

Such reports indicate the great amount of work that yet remains to be done in observation of the peculiarities of our honey flora. The collection and recording of this data is an interesting task which is commended to bee-keepers.

D.D.T. as an Anti-Ked Dipping Agent—*continued from page 389.*

time of treatment, and keds which hatched out from the pupae subsequent to treatment, were killed on migration to a toxic area of wool.

From the information available to the writer it is indicated that D.D.T. will control sheep ked providing the necessary precautions are taken to ensure that the active D.D.T. content of the bath does not fall below 0.05 per cent. concentration.

This statement is intended to provide some guide to woolgrowers who may decide to use D.D.T. for ked control. Further work is required, however, before a more definite recommendation can be made.

References.

[1]SHANAHAN, G. J.—1946. *N.S.W. Agr. Gaz.* Vol. 57, pp. 632-635.

[2]GRAHAM, N. P. H. and TAYLOR, K. L.—1941. C.S.I.R. (Aust.) Pamphlet No. 108.

THE advantages of mechanisation in land clearing are appealing increasingly to orchardists, and the presence of heavy bulldozers and related equipment in the district has recently been taken advantage of by Batlow growers, bulldozers of the 130 h.p. type being used to clear land of large standing timber which had been ringbarked some years ago. By means of the bulldozer it is possible to clear land in a fraction of the time and at a fraction of the cost of older methods, but every care must be taken that the least possible damage is done to the humus-laden superficial layer of soil, points out the Division of Horticulture of the Department of Agriculture. The ripper which follows the bulldozer, clears the roots to a depth of 21 inches, and thereby removes most of the Armillaria root rot fungus material.

The heavy equipment has also been used by Batlow growers for making dams, to enable supplementary watering of orchards.

1946-47

PARAFIELD EGG-LAYING COMPETITION

Supplement to "Journal of Agriculture," July, 1947

PARAFIELD EGG LAYING COMPETITION, 1946-47

GENERAL REVIEW

[By **ALLAN A. McARDLE,** Manager, Parafield Poultry Station.]

The eighteenth test of the present series of Official Egg Laying Competitions conducted at Parafield Poultry Station by the S.A. Department of Agriculture concluded on 31st March, 1947.

Conditions and regulations were the same for previous years. All available pens were filled and a heavy number of entries were refused; the Competition commenced on 1st April, 1946, with 501 birds, breeders throughout the State being well represented; a few interstate breeders also competed.

Selection of Pullets for Competition.

The birds entered in the 1946-1947 test were nearer the correct type for competition than has been the case for some years. The number of birds too forward or too backward was very low enabling a very good start to be made in the opening months of the test.

It has been found that in White Leghorns the pullets which do well and lay from the beginning of the test are well grown pullets of standard type and weight which have reached the stage where the comb is just falling over and which are just commencing to lay. The large birds, and those which have been laying for some time prior to 1st April, usually neck moult and do not produce to any extent during the opening two months. The backward birds which are five to six weeks behind production when entered are, of course, undesirable for competition work. The same remarks apply to the heavy breeds except, of course, that the comb is smaller.

The birds should have been handled under similar conditions of feeding to those operating at the Competition, or if this is not done they should have been on growing mash rather than a different type of laying mash to that fed at the Competition, if neck moults are to be avoided.

Production Results and Egg Size.

The laying obtained for the 1946-1947 test constituted an all-time record, being an over all average of 200.97 eggs per bird. This figure represents the average for all breeds; averages for individual breeds are shown in Tables Nos. 1 and 4.

The production of first grade eggs was 178.95 eggs per bird, equal to 89.04 per cent for the full period, and was a record for any test since the weighing of eggs has been carried out.

The system of collection and weighing is to collect all eggs twice daily in special numbered trays, and the eggs are then weighed on special scales reserved for this purpose. Collection is carried out by two attendants to ensure a double check, one collecting and placing the eggs in the trays and the other marking a stroke on the weighing sheet alongside the pen number of the bird from which the egg has been collected. When weighing is carried out each number is called and the weight given, and as a check, the stroke should be in the square under which the weight of the egg is then filled in.

The weight necessary for an egg to qualify as first grade is 1¾oz. during the period from 1st April to 31st May, 1⅞oz. from 1st June to 30th June, and 2oz. from 1st July to 31st March. During the test under review 95.45 per cent of eggs qualified for April-May, 98.32 per cent qualified for June, and 86.88 per cent qualified for July to March, inclusive.

The excellent percentage of first grade eggs shows that breeders have kept this factor well in mind, and also demonstrates the beneficial effect from a State and export viewpoint of the stringent weighing conditions imposed, demanding that the 2oz. minimum egg be the qualifying mark for nine months of the test.

Results as compared with previous competitions are set out in Tables A, B, and C.

General Comments on Production.

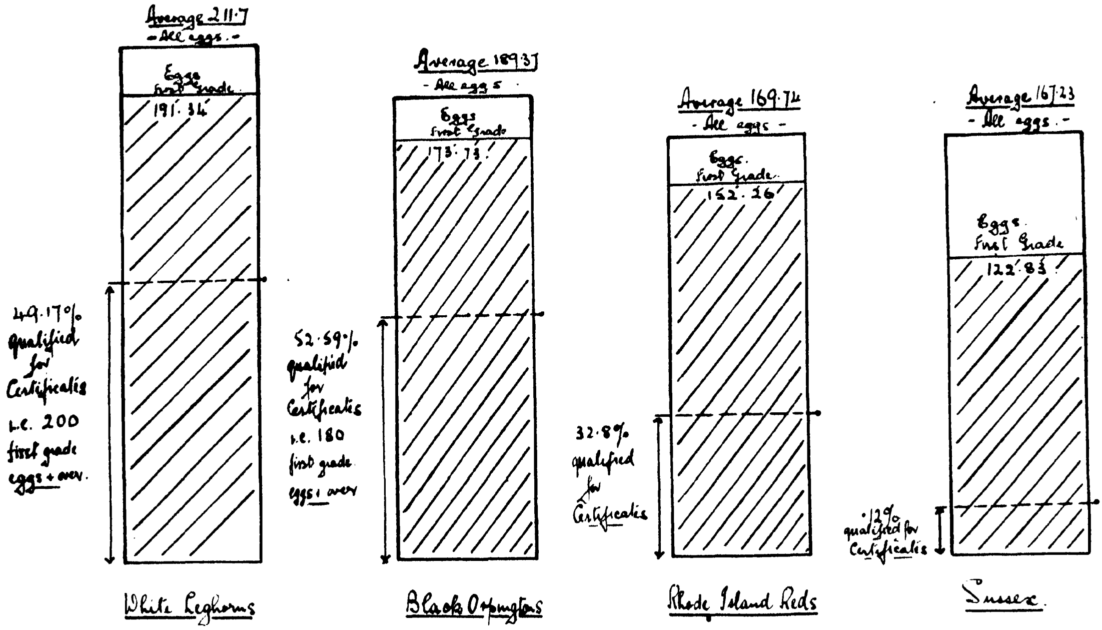
The results obtained in the 1946-1947 Competition indicate that the White Leghorn can still be regarded as the outstanding breed in this State. This section averaged 211.7 eggs per bird, of which 191.34 were first grade, and 49.17 per cent of the entries qualified for the Standard Certificates which are awarded to birds in this section which lay 200 first grade eggs and over.

They were closely followed by Black Orpingtons with an average of 189.37 eggs per bird, of which 173.73 were first grade, and 52.59 per cent of the birds in this section qualified for Standard Certificates, *i.e.*, 180 first grade eggs and over. This indicates a marked improvement in the general standard of Black Orpingtons in recent years, and the results of these birds in competition bear out the advice given to people desirous of entering the industry, *i.e.*, that the two commercial breeds are White Leghorns and Black Orpingtons, preference being the deciding factor in which is taken up.

The Rhode Island Red and Sussex sections are much lower in average, and first grade egg size is very low in the Sussex section.

These breed comparisons are shown on the accompanying diagram, the shaded portion indicating the proportion of first grade eggs laid by each breed.

Only one entry was received for Langshans, but this team gave excellent results with scores almost equal to Black Orpingtons (see Table No. 1), but it is really necessary to have several teams competing in a section to have an overall average comparison.



Comparative Production of Main Classes.

Weather Conditions.

A brief review of weather conditions during the 1946-1947 test may be of interest, in as much as seasonal variations have an effect on results from year to year.

Month.	Rainfall. Points.	Comments.
April	117	Cold conditions.
May	279	Wintry and cold nights.
June	129	Cloudy and cool.
July	337	Cloudy and showery.
August	160	Mainly fine.
September . ..	75	Chiefly fine.
October	140	Mainly fine (dust storms).
November . ..	151	Warm and unsettled.
December . ..	180	Changeable—4 days over 100deg.
January	20	Hot—4 days over 100deg.
February	74	Hot—6 days over 100deg.
March	552	Warm, hot winds, heavy thunder storms.
Total .. (in.)	22.14	April 1, 1946—March 31, 1947.

Feeding.

Birds in the Competition were fed on Parafield standard ration, comprising equal parts by weight of bran, pollard, and wholemeal, together with 8 per cent to 10 per cent meat-

meal, 5 per cent linseed meal, 1 per cent salt, and 50 per cent chaffed green feed by bulk added (40 per cent in winter period and 60 per cent in summer period).

The quantities fed per bird daily and for the 12 months period are set out below under the heading "Cost of Production." For average purposes in commercial flock feeding the quantities are approximately 3 lb. each of bran, pollard, and wholemeal; ¾ lb. to 1 lb. wheatmeal; ⅜ lb. to ½ lb. linseed meal; 1⅓oz. salt; ½ bucket chaffed green feed; and 10 lb. to 12 lb. wheat per 100 birds daily.

The purpose of feeding a plain standard laying ration to Competition entries is to obtain standard results and to ensure that the birds will be in good breeding condition following their testing in the Competition, this being regarded as more important than feeding for high scores. The question of mortality is also to be considered. The production of "long life" birds is very important from an industry point of view, for high mortality in pullets causes a severe drain on the resources of a poultry plant.

Experimental work at Parafield has shown that the addition of 1 per cent of a recognized vitaminized oil of known value gives better health and production. It has now been fed to competition birds during the last two tests with beneficial results to production and the general condition of the birds. The type used was 5,000 units Vitamin A and 500 units Vitamin D3 per c.c. The cost was only 3½d. per bird per year, or approximately 1d. to 1½d. per day per 100 birds.

Cost of Production.

The cost of feeding each bird in the Egg Laying Competition was 7s. 10½d. This figure includes the cost of bran, pollard, crushed wheat, meatmeal, linseed meal, salt, and vitaminized oil in the morning mash and also grain and an allowance for charcoal, shellgrit, and straw. It does not include the cost of green feed, which was fed at the average of 2½ buckets per day for the 500 birds.

Morning mashes cost 3s. 5½d. per bird, made up of the following quantities of ingredients at the prices shown. The daily quantities per bird of the main items fed were 0.424oz. each of bran, pollard, and wholemeal, 0.147oz. meatmeal, 0.0735oz. linseed meal, 1.97oz. wheat; making a daily total of 3.4625oz. per bird.

The feeding of green feed at the rate of 50 per cent by bulk enables reduced quantities of the other ingredients to be fed, saving approximately one-third of the cost of mash.

Commercial prices will be in excess of the above figures unless feed is bought in large quantities. For this reason the above costs have been itemized to allow calculations to be easily made by adjusting them to suit local prices, as individual weights fed should be the same if birds are fed under standard conditions. Threepence per bushel has been allowed for the cost of crushing wholemeal.

MASH CONSUMPTION PER BIRD 12 MONTHS.

Quantity.	Cost.	Price per lb., bush., or gall.	Price per ton, bag, or bush.
13 lb. bran	8½d.	1s. 1¼d. per bush.	£5 10s. per ton
13 lb. pollard	9¼d.	1s. 2·1d. per bush.	£5 17s. 6d. per ton
13 lb. wholemeal	1s. 1d.	5s. 1⅓d. per bush.	5s. 1⅓d. per bush.
3⅓ lb. meatmeal	5d.	1½d. per lb.	18s. per bag (140 lb.)
1⅔ lb. linseed meal	2d.	1¼d. per lb.	9s. 9d. per bag (100 lb.)
⅓ lb salt	¼d.	¾d. per lb.	5,000A
Vitaminized oil	3½d.	47s. 6d. per gall.	——— rating per c.c. 500D3
Total 44 lb.	3s. 5½d.	Approximately 1d. per lb.	—

Wheat Consumption Per Bird.

Each bird consumed 1.97oz. wheat daily, being 47.5 lb. wheat during the 12 months. The average price, including carriage of the wheat delivered at the station for the currency of the tests was 4s. 10 ⅓d. per bushel, hence wheat cost 3s. 10¼d. per bird.

It can be taken that each bird fed at the rate of the competition entries will consume approximately four-fifths of a bushel per year. If wheat is 5s. 10d. per bushel it will cost 4s. 8d. per year for wheat per bird, and local costs can readily be calculated on this basis.

With mash costing 3s. 5½d. and wheat 3s. 10½d. the combined cost of mash and wheat was 7s. 3¾d., and an allowance of 6¾d. is sufficient to cover the cost of charcoal, shell grit, and straw used per bird, giving a total of 7s. 10½d. after allowing for all feeding costs experienced commercially, with the exception of maintenance.

The total weight of feed per bird for the 12 months, exclusive of green feed, was 91.5 lb. costing 7s. 3¾d., which was approximately 1d. per pound for poultry feed for the 1946-1947 test.

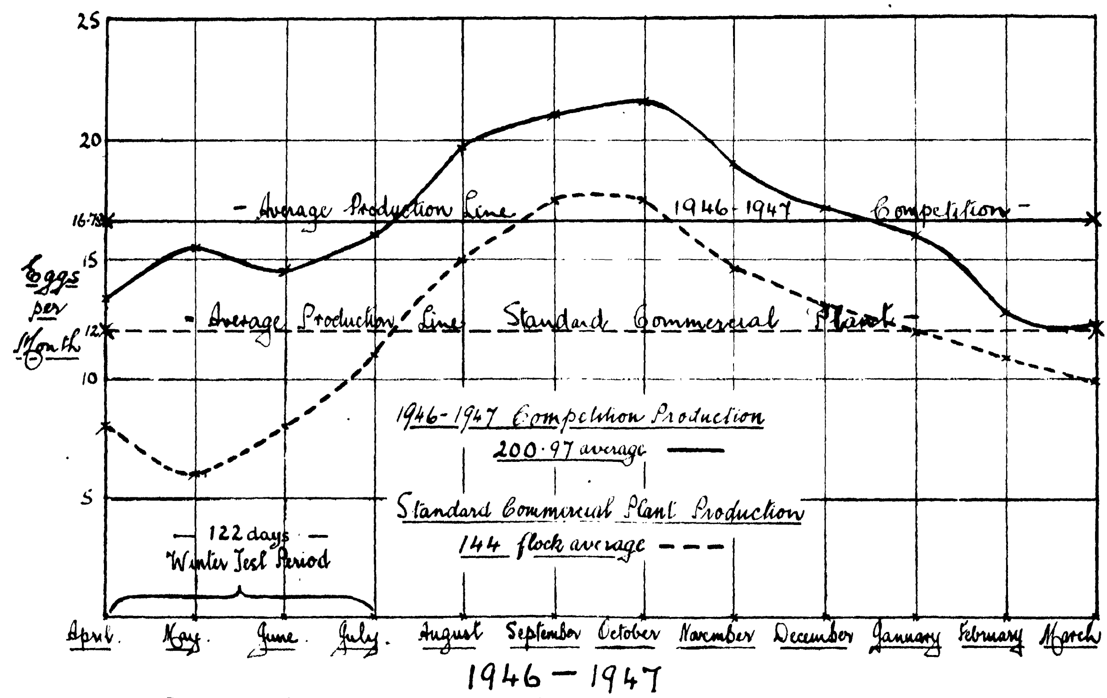
Egg Returns.

The average net price received over the 12 month period was 1s. 6.35d. for all eggs 1¾oz. and over. Eggs under 1¾oz. returned 1s. 3.35d. net, but the number obtained was neglible, as 95.45 per cent of the eggs laid during April-May weighed 1¾oz. and over, and during June 98.32 per cent weighed 1¾oz. and over. Thus the returns were on the basis of hen eggs and the average price has been arrived at on the basis of actual returns obtained.

Deductions included control fund, 1d. per dozen; grading 1d. to December, 1⅜d. January to March; commission ¾d.; carriage ¼d.; rejects ½d. to ⅞d. per dozen. The deductions varied from 3½d. to 4½d. per dozen off wholesale price, according to quality.

Month.	Average Net Price. s.	d.
April	1	8½
May	1	9
June	1	8½
July	1	9
August	1	5¼
September	1	3½
October	1	3½
November	1	3½
December	1	3¼
January	1	6
February	1	7¾
March	1	9½
Average =	1	6·35 per dozen

On a basis of 200.97 eggs per bird the returns averaged 25s. 7d. per bird, less 7s. 10½d. feeding expenses, leaving a margin of profit of



Comparison of 1946-47 Competition results with a standard commercial poultry farm.

The eggs laid by Competition birds were marketed separately, and after allowing for all deductions the monthly prices received were as shown below.

17s. 8½d. per bird. This figure was obtained from selected pullets only in single pens and represents a production cost of 5⅝d. per dozen; but on a well run commercial plant

maintaining a 12 dozen flock average the production costs would be 7⅞d. per dozen and the margin would only be as follows:—

	s.	d.	
12 dozen at 1s. 6.35d. ..	18	4½	approx.
Less feeding expenses ..	7	10½	
	10	6	margin of profit

This comparison is also shown on the accompanying graph comparing monthly production of competition birds and that of a standard poultry plant. This clearly shows the importance of flock averages and efficiency in difficult days of high feed prices.

Points of Interest and General Comments.

1. The winning bird, a Black Orpington owned by M. C. Wilson, laid 290 eggs—289 first grade and 1 egg just under 2oz. The total weight of eggs at 28oz. average per dozen was 42¼ lb., approximately 8 times the bird's body weight.

2. The lowest score in the Competition was a Black Oprington which laid 2 eggs, but remained alive for the currency of the test.

3. Mortality was one of the lowest recorded for any test, only 6.6 per cent or 33 birds of the 501 entered dying. Many breeders did not lose a bird, and of the 39 birds in the Home Project Section not one death occurred during the currency of the test. These results indicate that stamina has been considered as well as pedigree, and it is a point that is most important for the welfare of the industry.

4. The winning White Leghorn team entered by H. J. Gwynne laid the record score of 1,345 first grade eggs. One bird laid 116 eggs to 4th September and did not lay again, hence the other five birds averaged 245.8 eggs per bird.

5. Results from the White Leghorn and Black Orpington sections were the best of any Parafield tests ever conducted; 50.84 per cent of the birds completing the test qualified for Standard Certificates, *i.e.*, 200 first grade eggs for White Leghorns and 180 first grade eggs for Heavy Breeds.

6. The percentage of certificates obtained by the whole of 1946-1947 competition entries was 46.7 per cent and was the highest for any test, in spite of the Sussex section being only 12 per cent; 219 of the 468 birds which completed the test qualified for certificates.

7. The winning Home Project bird laid a sequence of 65 eggs with score of 276, and the section average was 214.15 eggs per bird.

8. The 1946-1947 Competition gave the *highest* number of first grade eggs and *lowest* number of second grade eggs ever recorded.

The complete list of Standard Certificate winners is given following on:—

Table A.—Summary of results of the last 11 Competitions.

Table B.—Comparative cost of production per dozen eggs.

Table C.—List of certificate percentages covering 1934-1947 period.

A set of six additional tables is also given covering:—

Table No. 1.—Summary of results of various classes, 1946-1947.

Table No. 2.—Percentages of first and second grade eggs.

Table No. 3.—Comparative production under and over 200 eggs for last 11 Competitions.

Table No. 4.—Comparative production of first grade eggs from various classes for certificate gradings.

Table No. 5.—Average monthly production of 1946-1947 test.

Table No. 6.—Average number of first and second grade eggs produced for 14 Competitions.

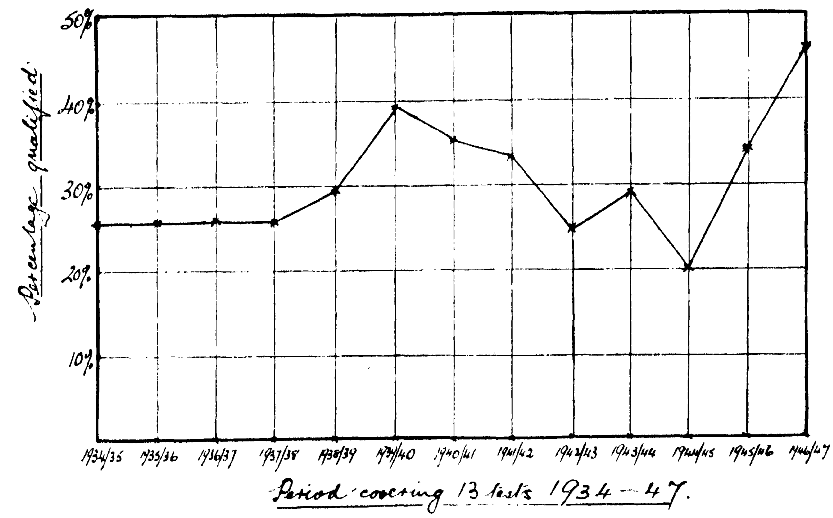
The Final Lists of Egg Scores which follow cover:—

1. Winning scores 1946-1947 test to 31st March, 1947, with comparisons with other tests.
2. Winning scores for Winter Test period from 1st April to 31st July, 122 days in all. Birds to lay well for Competition should be in sound position at end of July, and certificates are awarded to leading entries at this stage.
3. Complete list of all birds completing Competition, with scores of first and second grade eggs.

TABLE A.—SUMMARY OF RESULTS OF THE LAST ELEVEN COMPETITIONS.

Feeding Costs and Egg Returns.	1936-37.	1937-38.	1938-39.	1939-40.	1940-41.	1941-42.	1942-43.	1943-44.	1944-45.	1945-46.	1946-47.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Average cost of feeding per bird	6 9	7 6	5 7	4 9	6 3	6 9	6 3	5 5	5 11	6 9	7 10½
Average net price of eggs—											
1⅞oz. and over ...	1 0·86	1 2·66	1 2·06	1 1·16	1 2·39	1 2·27	1 6·07	—	—	—	—
1¾oz.	0 11·17	1 0·79	0 11·93	0 10·81	1 0·14	1 0·08	1 4·16	—	-	—	—
1⅞oz. and over ...	NOTE.—Marketing under S.A. Egg Board commenced 1942-43 Test. Grading altered to hen, 1⅞oz. and over.							1 7·69	1 7·94	1 7·25	1 6·35
Over 1½oz. and under 1⅞oz......								1 5·14	1 4·86	1 4·02	1 3·35
Average return per bird	17 7	18 8·6	17 10·3	17 6·4	18 2	18 2	21 11	24 6	23 6	25 6	25 7
Return over cost of feeding	10 9	11 3	12 3·5	12 9	11 11	11 5	15 8	19 1	17 7	18 9	17 8½
Average number of eggs laid per bird	198	187·6	187·1	197·2	185·6	188·7	178·0	179·3	169·9	190·6	200·97

Feeding cost for 1946-47 test includes 6·75 allowance for charcoal, shell grit, and straw. Egg returns have allowance of average reduction ¾d. per dozen for carriage and rejects as obtained commercial poultrymen (ap. 1s. 0½d. per bird in test).



Entries qualifying for Standard Certificates.

TABLE B.—COST OF FEED (OR PRODUCTION) PER DOZEN EGGS.

Competition.	Approximate Cost per Dozen.
	d.
1937-38	5·75
1938-39	4·41
1939-40	3·47
1940-41	4·84
1941-42	5·15
1942-43	5·05
1943-44	4·33
1944-45	5·01
1945-46	5·10
1946-47	5·66

1946-47 cost of 5·66d. per dozen is on a basis of 200·97 average production. On a basis of 12 dozen average the cost would be 7·875d. per dozen.

TABLE C.—STANDARD CERTIFICATES.

Competition.	No. of Birds Completed Test.	No. of Birds Qualified Standard Certificate.	Percentage Qualified Standard Certificate.
			Per Cent.
1934-35	442	119	27·0
1935-36	427	115	27·0
1936-37	468	129	27·5
1937-38	365	99	27·1
1938-39	352	103	29·2
1939-40	420	168	39·5
1940-41	413	147	35·5
1941-42	392	131	33·4
1942-43	253	62	24·5
1943-44	389	112	28·8
1944-45	433	87	20·0
1945-46	415	145	34·9
1946-47	468	219*	46·7*

PERCENTAGE OF CERTIFICATES GAINED.

Class.	Breed.	No. of Birds Completed Contest.	No. of Birds Gained Certificate.	Percentage.
1	White Leghorn .	240	118	49·17
3	Black Orpington	135	71	52·59
4	Light Sussex . . .	25	3	12·00
5	Rhode Island Red and Langshans	29	10	34·48
6	Any breed, Home Project Section	39	17	43·59
		468	219	46·70

Standard Certificate Winners.

SECTION 1.—WET MASH—*White Leghorns.*

Competitor.	Bird No.	Score.
R. G. Slape, Brookhaven Stud Poultry Farm, Wattle Flat	5 8	253 219
Ashgrove Stud Poultry Farm, Mountain Road, Cockatoo Valley, Victoria	13 16 21 23 24	227 217 237 215 218
F. A. Mundy & Son, 16 Angas Avenue, North Walkerville	25 26 27 30 32	209 217 246 208 276
H. R. Klose, Birdwood	37 38 39 42 46 47	235 208 240 209 215 205
T. Reece, 23 Angas Avenue, North Walkerville	54 55 56 57 58	204 220 223 224 212
E. O. Dorney, 16 Norman Avenue, Westbourne Park	61 62 63 65 66 69 71	235 243 221 223 222 244 202
W. C. Grigg, Lavinia Street, Woodville North	75 80 81	227 214 233
H. H. Gallagher, Royal Avenue, Pooraka	82	218

SECTION 1.—WET MASH—*continued.*

Competitor.	Bird No.	Score.
D. K. Magor, Winzor Road, Salisbury	88 93	209 213
A. E. Clisby & Son, 4 Angas Avenue, North Walkerville	94 96 97	247 230 218
Arthur Garbutt, Adelaide Road, Strathalbyn	103 104 105	203 240 231
Theo. Klingner, Jamestown	106	212
D. W. and A. Munt, 82 Mooringa Avenue, Plympton	112 113 117	262 217 220
R. E. Collett, Harvey Avenue, Plympton	119 120 123	220 206 216
H. J. Gwynne, Daly Street, Gawler	124 125 127 128 129	253 251 257 235 233
R. F. Bennett, "Pira Lilla," Cockatoo Valley	131 132 134 135	208 224 208 220
J. C. Reedman, 51 Gilbert Street, Gilberton	137 139	255 208
Messrs. Sweeney Bros., 55 Rundle Street, Ararat, Victoria	144 145 146	211 246 218
C. V. Latz, Cross Roads, Edwardstown	149 150	203 232
A. S. Hutchinson, Coulls Road, Athelstone	154 155	210 232
H. G. Hersey, Church Road, Magill	160 163 164	227 243 209
R. A. Ansell, West Terrace, Strathalbyn	168 169 170 171	201 218 217 223
F. M. Robinson, Sweetman's Road, Edwardstown	173 176	205 202
Scottsburn Stud Poultry Farm, Echunga	178 182 183	208 210 215
G. J. Godden, 28 Albion Avenue, Glandore West	185 186 187 189	211 246 236 202

SECTION 1.—WET MASH—*continued.*

Competitor.	Bird No.	Score.
G. P. Hicks, Box 120, Clare	191 193 195	233 257 232
Charles R. Thomas, Glynde Road, East Payneham	197 199 200 201	234 206 205 241
H. W. C. Aubertin, Maurice Road, Murray Bridge	203 205	245 240
E. J. U. Burman, Box 68, Pinnaroo	208	213
G. Wormald, Pooraka	215	212
T. P. Sweeney, 61 Rundle Street, Ararat, Victoria	220 223 225	247 264 242
H. J. Mills, 108 Edward Street, Edwardstown	228 229 230	233 214 264
Wilkinson Bros., Ben Nevis, *via* Ararat, Victoria	233 234 235 236	207 205 206 219
C. J. C. Burton, 14 Stockade Reserve, Northfield	238 239 240	214 236 250

Winning bird of White Leghorn Section entered by F. A. Mundy & Son. This bird laid 276 first grade eggs, the highest score since 1939.

SECTION 1.—WET MASH—*continued.*

Competitor.	Bird No.	Score.
H. W. and R. D. Pearce, Lobethal	241	216
R. G. Scudds, Bordertown	245 246	244 217
A. P. Urlwin, Box 80, Balaklava	249	219
J. W. T. Trenorden, 44 Knightsbridge Road, Hazelwood Park	250 251 252	204 206 237
E. T. J. Trenorden, 57 Kyle Street, Glenside	254	211
B. Tait, 26 Government Road, Croydon	256 257 258	217 221 228

Class 3.—Black Orpingtons.

Competitor.	Bird No.	Score.
H. H. Gallagher, Royal Avenue, Pooraka	259	182
D. K. Magor, Winzor Road, Salisbury	265 266 268 270	219 210 184 204
A. E. Clisby & Son, 4 Angas Avenue, North Walkerville	273 274 275	262 226 197
A. Garbutt, Adelaide Road, Strathalbyn	278 281 282	212 221 249
Theo. Klingner, Jamestown	286 287	193 221
D. W. and A. M. Munt, 82 Mooringa Avenue, Plympton	289 292	205 199
R. E. Collett, Harvey Avenue, Plympton	297 300	222 222
H. J. Gwynne, Daly Street, Gawler	301	190
R. F. Bennett, Pira Lilla, Cockatoo Valley	307 308 310 312	242 210 182 213
J. C. Reedman, 51 Gilbert Street, Gilberton	313 315 317 318	200 223 274 238
J. G. Hamilton, 119 Portrush Road, Glenside	320 324	192 225

SECTION 1.—WET MASH—*continued.*
Class 3.—Black Orpingtons—continued.

Competitor.	Bird No.	Score.
F. M. Pearce, Box 2, Burra North	325	250
	327	213
	328	261
	329	180
M. C. Wilson, 1 Jetty Road, Grange	332	289
	333	204
	334	234
	335	246

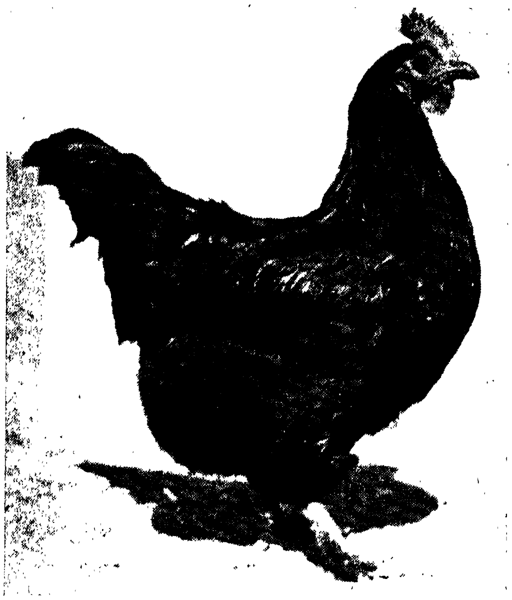
The Black Orpington which gained highest score in the competition with 289 first grade eggs, a record for the Parafield Competition. It was entered by Mr. M. C. Wilson.

C. H. Lines, 87 Seventh Avenue, St. Peters	337	234
	338	204
	341	235
F. A. Langley, 122 Torrens Road, Kilkenny	343	209
	344	202
	346	193
	347	187
R. C. Scudds, Bordertown	350	218
	354	200
H. J. Mills, 108 Edwards Street, Edwardstown	355	220
	357	201
	358	182

SECTION 1.—WET MASH—*continued.*
Class 3.—Black Orpingtons—continued.

Competitor.	Bird No.	Score.
G. Wormald, Pooraka	361	216
	365	223
H. W. C. Aubertin, Maurice Road, Murray Bridge	368	187
Scottsburn Stud Poultry Farm, Echunga	373	246
	374	206
	375	201
Sweeney Bros., 55 Rundle Street, Ararat, Victoria	376	259
	377	183
	378	208
H. W. and R. D. Pearce, Lobethal	379	226
	380	248
A. P. Urlwin, Box 80, Balaklava	383	187
E. T. J. Trenorden, 57 Kyle Street, Glenside	386	229
	387	202
A. J. Waugh, Helm Road, Kangaroo Flat, *via* Bendigo	388	225
	389	187
Merv. Smith, 37 Scott Street, Parkside	391	232
	393	255
Colin J. Easther, 3 Fairmont Street, Black Forest	395	203
	396	231
J. Morrow & Son, 82 Augusta Street, Glenelg	400	249
	401	206
	402	266
Class 4.—Light Sussex.		
B. H. Leonard, Bracknell, Tasmania	411	197
	412	199
Ben R. Hart, Uraidla	417	184

The winning Light Sussex, entered by Mr. B. H. Leonard, laid 199 first grade eggs.



The winning Langshan entry of Mr. C. H. Lines which laid 256 first grade eggs and secured highest score in Any Other Heavy Breed Section with the highest score since 1940.

SECTION 1.—WET MASH—*continued.*

Class 5.—Rhode Island Reds and Langshans.

Langshans.

Competitor	Bird No.	Score.
C. H. Lines, 87 Seventh Avenue, St. Peters	434 435 436	242 249 256
Rhode Island Reds.		
Scottsburn Stud Poultry Farm, Echunga	445	184
H. W. and R. D. Pearce, Lobethal	449 450	186 239
Rex Kidman, "Camgerwarra," Lower Light	453	186
A. Perkins, 5 Eastgate Street, Pascoe Vale South	454	188
Eric F. Snow, 18 Mount Barker Road, Glen Osmond	457	189
D. McKay, Hillcroft Poultry Farm, 47 Landells Road, Pascoe Vale	460	245

SECTION 2.—WET MASH—HOME PROJECT UTILITY WORKERS.

Class 6.—Any Breed.

Competitor.	School.	Breed.	Bird No.	No. of First Grade Eggs.
Robert Phelps	Urrbrae High	White Leghorn	463	206
Brian McInerney	Glenelg	White Leghorn	468	201
Kevin McInerney	Glenelg	White Leghorn	471	213
Barry Tydeman	Glenelg	White Leghorn	473	202
John Oliver	Glenelg	White Leghorn	474	228
Bryon Cave	Glenelg	White Leghorn	475	214
Allan Wormald	Pooraka	Black Orpington	480	195
Ian Gordon	Westbourne Park	Black Leghorn	481	235
Ron Cole	Westbourne Park	Black Leghorn	486	214
Clarrie Henry	Westbourne Park	Black Orpington	487	199
D. K. Cawthorne	Hanson	Black Orpington	490	244
Colin Hollow	Urrbrae High	Black Orpington	493	240
Elaine Schroeder	Middleton	Black Orpington	494	183
Brian Hentschke	Brinkworth Area	Black Orpington	495	276
G. P. O'Reilly	Woodville	Black Orpington	496	182
Norman Barnett	Westbourne Park	Rhode Island Red	497	193
Katherine Robinson	Hanson	Rhode Island Red	498	183

TABLE NO. 1.—SUMMARY OF THE RESULTS OF THE VARIOUS CLASSES 1946-47.

Class.	Breed.	No. of Birds Entered.	Percentage of Total Entries.	No. of Birds Died.	Percentage of Deaths in Class.	No. of Birds Completed Test.	Production First-Grade Eggs. No.	Production First-Grade Eggs. Average per Bird.	Production Second-grade Eggs. No.	Production Second-grade Eggs. Average per Bird.	Total Eggs Produced. No.	Total Eggs Produced. Average per Bird.
1	White Leghorn	258	51·50	18	6·98	240	45,921	191·34	4,887	20·36	50,808	211·70
2	No entries...........	—	—	—	—	—	—	—	—	—	—	—
3	Black Orpingtons	144	28·74	9	6·25	135	23,454	173·73	2,112	15·64	25,566	189·37
4	Light Sussex	30	5·99	5	16·90	25	3,068	122·83	1,120	44·80	4,188	167·63
5	Rhode Island Red....	24	4·79	1	4·17	23	3,502	152·26	402	17·48	3,904	169·74
	Langshans	6	1·20	—	—	6	1,222	203·67	13	2·16	1,235	205·83
6 (Any breed)	White Leghorn (14) . Black Orpington (20) Rhode Island Red (3) Light Sussex (2)	39	7·78	—	—	39	6,580	168·72	1,772	45·43	8,352	214·15
	Total all classes ..	501	100·00	33	6·59	468	83,747	178·95	10,306	22·02	94,053	200·97

Winner of the Home Project Section, this Black Orpington entered by Brian Hentschke laid 276 first grade eggs, a record score for this section.

TABLE NO. 2.—PERCENTAGES OF FIRST AND SECOND GRADE EGGS FOR THREE PERIODS.

Period.	Total Eggs Laid.	Number of First Grade Eggs.	Percentage First Grade.	Number of Second Grade Eggs.	Percentage Second Grade.
April-May .	14,393	13,738	95·45	655	4·55
June	7,006	6,888	98·32	118	1·68
July-March	72,654	63,121	86·88	9,533	13·12
	94,053	83,747	89·04	10,306	10·96

TABLE NO. 3.—GROUPS OF EGG PRODUCTION FOR LAST ELEVEN COMPETITIONS.

Competition.	Production 200 Eggs and Under. No. of Birds.	Production 200 Eggs and Under. Per Cent.	Production 201 Eggs and Over. No. of Birds.	Production 201 Eggs and Over. Per Cent.
1936-37	214	45·73	254	54·27
1937-38	210	57·53	155	42·47
1938-39	183	51·99	169	48·01
1939-40	195	46·43	225	53·57
1940-41	220	53·27	193	46·73
1941-42	219	55·87	173	44·13
1942-43	156	61·66	97	38·34
1943-44	240	61·70	149	38·30
1944-45	299	69·05	134	30·95
1945-46	208	50·12	207	49·88
1946-47	279	59·62	189	40·38

In the 1946-47 competition, 170 birds (36·32 per cent) laid 201-250 eggs per bird; and 19 birds (4·06 per cent) laid 250 eggs and over per bird.

TABLE NO. 4.—GROUPS OF PRODUCTION IN THE SEPARATE CLASSES.

First Grade Eggs Only.

Class.	Breed.	No. of Birds Completed Test.	Production 180 Eggs and Under.		Production 181 to 200 Eggs.		Production 201 Eggs and Over.	
			No. Birds.	Per Cent.	No. Birds.	Per Cent.	No. Birds.	Per Cent.
1	White Leghorn	240	87	36·25	35	14·58	118	49·17
3	Black Orpington	135	65	48·15	16	11·85	55	40·74
4	Light Sussex	25	22	88·00	3	12·00	—	—
5	Rhode Island Red and Langshan	29	18	62·07	5	17·24	5	17·24
6	Any breed, Home Project Section	39	20	51·28	6	18·49	11	28·21
	Total	468	214	45·34	65	14·28	189	40·38

TABLE NO. 5.—PARTICULARS OF EGGS LAID EACH MONTH.

Number of Birds.	Month.	Total Number of Eggs Laid.	Average Number of Eggs Laid Per Bird.	Average Percentage Eggs Laid Per Bird.	Monthly Percentage of the Total Production of Eggs.
	1946—				
501	April	6,757	13·49	44·97	6·98
500	May	7,637	15·27	49·26	7·89
499	June	7,021	14·07	46·90	7·26
499	July	7,923	15·88	51·23	8·19
498	August ...	9,826	19·73	63·65	10·16
496	September	10,496	21·16	70·53	10·85
489	October ..	10,442	21·35	68·87	10·79
488	November.	8,955	18·35	61·17	9·25
483	December	8,157	16·89	53·19	8·43
	1947—				
481	January ..	7,880	16·38	52·84	8·14
468	February..	5,945	12·70	45·36	6·14
468	March	5,720	12·22	39·42	5·91
		96,759			

TABLE NO. 6.—AVERAGE NUMBER OF EGGS LAID PER BIRD.

Number of Birds Entered.	Competition Year.	Number of Birds Completed Test.	Average Number First Grade Eggs Laid.	Average Number Second Grade Eggs Laid.	Average Number of all Eggs Laid.
243	1933-34 ..	225	120·8	37·3	158·2
485	1934-35 ..	442	153·5	38·0	191·2
455	1935-36 ..	427	156·0	29·2	185·2
501	1936-37 ..	468	155·2	42·8	198·0
401	1937-38 ..	365	158·6	29·0	187·6
403	1938-39 ..	352	159·4	27·6	187·1
459	1939-40 ..	420	168·0	29·1	197·2
446	1940-41 ..	413	163·2	22·3	185·6
433	1941-42 ...	392	163·3	25·4	188·7
275	1942-43 ..	253	149·7	28·3	178·0
411	1943-44 ..	389	156·9	22·4	179·3
459	1944-45 ..	433	143·4	26·4	169·9
463	1945-46 ..	415	161·25	29·38	190·63
501	1946-47 ..	468	178·95	22·02	200·97

LEADING SCORES AS AT 31st MARCH, 1947.

	Placed.	Bird No.	Competitor.	No. of First Grade Eggs.	Comparisons Since Weighing of All Eggs, 1933-34.
			White Leghorn.		
Singles	First	32	F. A. Mundy & Son	276	Highest since 1939
	Second	230	H. J. Mills	264	
		223	T. P. Sweeney	264	
Trios	First	127–129	H. J. Gwynne	725	Highest since 1941
	Second	238–240	C. J. C. Burton	700	
	Third	61–63	E. O. Dorney	699	
Teams	First	124–129	H. J. Gwynne	1,345	Record
	Second	61–66	E. O. Dorney	1,310	
	Third	37–42	H. R. Klose	1,276	

LEADING SCORES AS AT 31ST MARCH, 1947.—*continued.*

	Placed.	Bird No.	Competitor.	No. of First Grade Eggs.	Comparisons Since Weighing of All Eggs, 1933-34.
			BLACK ORPINGTON.		
Singles	First	332	M. C. Wilson	289	Record
	Second	317	J. C. Reedman	274	
	Third	402	J. Morrow & Son	266	
Trios	First	400–402	J. Morrow & Son	721	Highest since 1935
	Second	316–318	J. C. Reedman	654	
	Third	373–375	Scottsburn Poultry Farm	653	
Teams	First	313–318	J. C. Reedman	1,230	
	Second	325–330	F. M. Pearce	1,174	
	Third	307–312	R. F. Bennett	1,150	
			LIGHT SUSSEX.		
Singles	First	412	B. H. Leonard (Tas.)	199	—
	Second	411	B. H. Leonard (Tas.)	197	
	Third	417	B. R. Hart	184	
Trios	First	415–417	B. R. Hart	464	—
	Second	412–414	B. H. Leonard	443	
	Third	409–411	B. H. Leonard	385	
Teams	First	409–414	B. H. Leonard	828	—
	Second	415–420	B. R. Hart	581	
	Third	403–408	F. A. Langley	509	
			ANY OTHER HEAVY BREED.		
Singles	First	436	C. H. Lines (Langshan)	256	Highest since 1940
	Second	435	C. H. Lines (Langshan)	249	
	Third	460	D. McKay (Rhode Island Red)	245	
Trios	First	433–435	C. H. Lines (Langshan)	643	Record
	Second	436–438	C. H. Lines (Langshan)	579	
	Third	451–453	R. Kidman (Rhode Island Red)	520	
Teams	First	433–438	C. H. Lines (Langshan)	1,222	Record
	Second	439–444	E. J. Cawthorne (Rhode Island Red)	845	
			HOME PROJECT UTILITY WORKERS.		
	First	495	Brian Hentschke (Black Orpington)	276	Record
	Second	490	D. K. Cawthorne (Black Orpington)	244	
	Third	493	Colin Hollow (Black Orpington)	240	

FINAL WINTER COMPETITION AS AT 31ST JULY, 1946.

	Placed.	Bird No.	Competitor.	No. of First Grade Eggs.
			WHITE LEGHORN.	
Singles	First	161	H. G. Hersey	93
	Second	114	D. W. and A. M. Munt	92
	Third	32	F. A. Mundy & Son	90
Trios	First	112–114	D. W. and A. M. Munt	260
	Second	124–126	H. J. Gwynne	239
	Third	127–129	H. J. Gwynne	236
Teams	First	124–129	H. J. Gwynne	475
	Second	112–117	D. W. and A. M. Munt	467
	Third	160–165	H. G. Hersey	455
			BLACK ORPINGTON.	
Singles	First	380	Pearce Bros.	96
	Second	332	M. C. Wilson	95
	Third	342	C. H. Lines	94
		377	Sweeney Bros.	94
Trios	First	400–402	J. Morrow & Sons	260
	Second	376–378	Sweeney Bros. (Victoria)	251
	Third	340–342	C. H. Lines	238

FINAL WINTER COMPETITION AS AT 31ST JULY, 1947.—*contiuued.*

	Placed.	Bird No.	Competitor.	No. of First Grade Eggs.
		BLACK	ORPINGTON—continued.	
Teams	First	271–276	A. E. Clisby & Son	464
	Second	349–354	R. G. Scudds	403
	Third	277–282	Arthur Garbutt	380
			LIGHT SUSSEX.	
Singles..........	First	417	B. R. Hart	75
		425	F. V. Alvey	75
	Third	406	F. A. Langley	74
Trios	First	409–411	B. H. Leonard	168
	Second	424–426	F. V. Alvey	165
	Third	412–414	B. H. Leonard	162
Teams	First	409–414	B. H. Leonard	330
	Second	403–408	F. A. Langley	263
	Third	415–420	B. R. Hart	190
			ANY OTHER HEAVY BREED.	
Singles..........	First	445	Scottsburn Stud (Rhode Island Red)	87
	Second	436	C. H. Lines (Langshan)	85
	Third	435	C. H. Lines (Langshan)	81
		457	E. F. Snow (Rhode Island Red)	81
Trios	First	445–447	Scottsburn Stud (Rhode Island Red)	217
	Second	433–435	C. H. Lines (Langshan)	212
	Third	436–438	C. H. Lines (Langshan)	191
Teams	First	433–438	C. H. Lines (Langshan)	403
			HOME PROJECT UTILITY WORKERS.	
	First	486	R. Cole (Black Orpington)............	89
	Second	498	K. Robinson (Rhode Island Red)	87
	Third	490	D. K. Cawthorne (Black Orpington)	86
		496	G. P. O'Reilly (Black Orpington)............	86

Final Scores.

SECTION 1.—WET MASH.—*Class* 1.—*White Leghorn.*

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
R. G. Slape,	1	158	55		
Brookhaven Stud	2	182	92		
Poultry Farm,	3	196	1	536	
Wattle Flat	4	168	17		
	5	253	—		
	6	died		421	957
	7	174	74		
	8	219	3		
	9	died		393	
	10	184	1		
	11	197	5		
	12	110	122	491	884
Ashgrove Stud Poultry	13	227	—		
Farm,	14	163	80		
Mountain Road,	15	152	30	542	
Cockatoo Valley	16	217	—		
	17	102	40		
	18	150	—	469	1,011
	19	198	3		
	20	151	55		
	21	237	2	586	
	22	died			
	23	215	4		
	24	218	—	433	1,019
F. A. Mundy & Son,	25	209	3		
16 Angas Avenue,	26	217	9		
North Walkerville	27	246	1	672	
	28	170	2		
	29	76	—		
	30	208	1	454	1,126
	31	72	3		
	32	276	4		
	33	died		348	
	34	169	27		
	35	116	—		
	36	164	—	449	797

SECTION 1.—WET MASH—*continued.*
Class 1.—*White Leghorn*—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
H. R. Klose,	37	235	6		
Birdwood	38	208	12		
	39	240	2	683	
	40	187	1		
	41	197	57		
	42	209	—	593	1,276
	43	193	1		
	44	156	1		
	45	153	1	502	
	46	215	16		
	47	205	37		
	48	142	2	562	1,064
T. Reece,	49	178	11		
23 Angas Avenue,	50	161	49		
North Walkerville	51	173	98	512	
	52	133	32		
	53	170	41		
	54	204	1	507	1,019
	55	220	—		
	56	223	2		
	57	224	2	667	
	58	212	38		
	59	141	82		
	60	154	8	507	1,174
E. O. Dorney,	61	235	2		
16 Norseman Avenue,	62	243	43		
Westbourne Park	63	221	—	699	
	64	166	1		
	65	223	7		
	66	222	—	611	1,310
	67	died			
	68	171	2		
	69	244	3	415	
	70	149	1		
	71	202	1		
	72	195	2	546	961

SECTION 1.—WET MASH—*continued.*
Class 1.—*White Leghorn*—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
W. C. Grigg,	73	139	5		
Lavinia Street,	74	163	4		
Woodville North	75	227	1	529	
	76	174	82		
	77	125	74		
	78	147	1	446	975
	79	155	20		
	80	214	10		
	81	233	..	602	
H. H. Gallagher,	82	218	6		
Royal Avenue,	83	died			
Pooraka	84	172	—	390	
	85	72	4		
	86	died			
	87	190	1	262	652
D. K. Magor,	88	209	—		
Winzor Road,	89	174	—		
Salisbury	90	173	1	556	
	91	155	—		
	92	188	3		
	93	213	—	556	1,112
A. E. Clisby & Son,	94	247	—		
4 Angas Avenue,	95	50	1		
North Walkerville	96	230	3	527	
	97	218	3		
	98	174	81		
	99	157	22	549	1,076
Arthur Garbutt,	100	123	3		
Adelaide Road,	101	142	95		
Strathalbyn	102	173	50	438	
	103	203	6		
	104	240	3		
	105	231	1	674	1,112
Theo. Klingner,	106	212	31		
Jamestown	107	138	101		
	108	192	10	542	
	109	188	8		
	110	158	42		
	111	199	—	545	1,087
D. W. and A. Munt,	112	262	6		
82 Mooringa Avenue,	113	217	..		
Plympton	114	188	100	667	
	115	188	1		
	116	194	74		
	117	220	1	602	1,269
R. E. Collett,	118	died			
Harvey Avenue,	119	226	7		
Plympton	120	206	1	432	
	121	198	1		
	122	died			
	123	216	15	414	846
H. J. Gwynne,	124	253	4		
Daly Street, Gawler	125	251	3		
	126	116	—	620	
	127	257	2		
	128	235	--		
	129	233	4	725	1,345
R. S. Bennett,	130	173	13		
"Pira Lilla,"	131	208	26		
Cockatoo Valley	132	224	1	605	
	133	182	1		
	134	208	—		
	135	220	6	610	1,215
J. C. Reedman,	136	161	--		
51 Gilbert Street,	137	255	13		
Gilberton	138	193	2	609	
	139	208	10		
	140	151	6		
	141	died		359	968
Messrs. Sweeney Bros.,	142	199	—		
55 Rundle Street,	143	160	3		
Ararat, Victoria	144	211	11	570	
	145	246	6		
	146	218	12		
	147	191	21	655	1,225

SECTION 1.—WET MASH—*continued.*
Class 1.—*White Leghorn*—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
C. V. Latz,	148	died			
Cross Roads,	149	203	1		
Edwardstown	150	232	1	435	
	151	186	—		
	152	died			
	153	179		365	800
W. S. Hutchinson,	154	210	25		
Coulls Road,	155	232	9		
Athelstone	156	108	37	550	
	157	96	87		
	158	156	85		
	159	186	53	438	988
H. G. Hersey,	160	227	8		
Church Road, Magill	161	185	15		
	162	96	64	508	
	163	243	6		
	164	209	3		
	165	154	--	606	1,114
R. A. Ansell,	166	129	40		
West Terrace,	167	128	3		
Strathalbyn	168	201	--	458	
	169	218	1		
	170	217	—		
	171	223	23	658	1,116
F. M. Robinson,	172	197	1		
Sweetman's Road,	173	205	15		
Edwardstown	174	154	43	556	
	175	164	31		
	176	202	45		
	177	140	65	506	1,062
Scottsburn Stud	178	208	..		
Poultry Farm,	179	137	89		
Echunga	180	195	1	540	
	181	157	17		
	182	210	9		
	183	215	1	582	1,122
G. J. Godden,	184	died			
28 Albion Avenue,	185	211	1		
Glandore West	186	246	7	457	
	187	236	1		
	188	died			
	189	202	5	438	895
G. P. Hicks,	190	141	114		
Box 120, Clare	191	233	3		
	192	174	69	548	
	193	257			
	194	145	1		
	195	232	6	634	1,182
Charles R. Thomas,	196	191	89		
Glynde Road,	197	234	11		
East Payneham	198	179	87	604	
	199	206	1		
	200	205			
	201	241	21	652	1,256
H. W. C. Aubertin,	202	165	57		
Maurice Road,	203	245	-		
Murray Bridge	204	194		604	
	205	240	6		
	206	died			
	207	187	72	427	1,031
E. J. U. Burman,	208	213	15		
Box 68, Pinnaroo	209	142	1		
	210	199	-	554	
	211	198	--		
	212	169	1		
	213	142	103	509	1,063
G. Wormald,	214	131	94		
Pooraka	215	212	2		
	216	158	48	501	
	217	111	94		
	218	193	35		
	219	46	138	350	851
T. P. Sweeney,	220	247	35		
61 Rundle Street,	221	178	75		
Ararat, Victoria	222	173	112	598	
	223	264	1		
	224	156	100		
	225	242	13	662	1,260

SECTION 1.—WET MASH—*continued.*

Class 1.—*White Leghorn*—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
H. J. Mills,	226	158	34		
108 Edward Street,	227	147	—		
Edwardstown	228	233	1	538	
	229	214	—		
	230	264	1		
	231	died		478	1,016
Wilkinson Bros.,	232	106	175		
Ben Nevis,	233	207	34		
***via* Ararat, Victoria**	234	205	6	518	
	235	206	27		
	236	219	43		
	237	198	—	623	1,141
C. J. C. Burton,	238	214	15		
14 Stockade Reserve,	239	236	1		
Northfield	240	250	8	700	
H. W. and R. D. Pearce,	241	216	—		
Lobethal	242	187	48		
	243	131	10	534	
R. G. Scudds,	244	153	22		
Bordertown	245	244	1		
	246	217	26	614	
A. P. Urlwin,	247	180	1		
Box 80, Balaklava	248	died			
	249	219	—	399	
J. W. T. Trenorden,	250	204	—		
44 Knightsbridge	251	206	2		
Road, Hazelwood Park	252	237	3	647	
E. T. J. Trenorden,	253	died		2	
57 Kyle Street,	254	211	—		
Glenside	255	171	—	38	
B. Tait,	256	217	7		
26 Government Road,	257	221	1		
Croydon	258	228	7	666	

Class 3.—*Black Orpingtons* (144 *Birds Competing*).

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
H. H. Gallagher,	259	182	8		
Royal Avenue,	260	died			
Pooraka	261	died		182	
	262	163	2		
	263	32	—		
	264	171	1	366	548
D. K. Magor,	265	219	11		
Winzor Road,	266	210	2		
Salisbury	267	73	62	502	
	268	184	94		
	269	died			
	270	204	—	388	890
A. E. Clisby & Son,	271	died			
4 Angas Avenue,	272	[illegible]	10		
North Walkerville	273	[illegible]	1	415	
	274	[illegible]	—		
	275	[illegible]	20		
	276	[illegible]	27	595	1,010
Arthur Garbutt,	277	144	10		
Adelaide Road,	278	212	3		
Strathalbyn	279	147	17	503	
	280	116	3		
	281	221	1		
	282	249	1	586	1,089
Theo. Klingner,	283	122	6		
Jamestown	284	7	8		
	285	146	1	275	
	286	193	34		
	287	221	16		
	288	149	47	563	838
D. W. and A. M. Munt,	289	205	1		
82 Mooringa Avenue,	290	77	—		
Plympton	291	166	2	448	
	292	199	7		
	293	107	16		
	294	131	—	437	885

SECTION 1.—WET MASH—*continued.*

Class 3.—*Black Orpington*—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
R. E. Collett,	295	129	7		
Harvey Avenue,	296	147	77		
Plympton	297	222	20	498	
	298	39	27		
	299	65	—		
	300	222	—	326	824
H. J. Gwynne,	301	190	9		
Daly Street, Gawler	302	179	33		
	303	141	3	510	
	304	151	4		
	305	152	19		
	306	122	—	425	935
R. F. Bennett,	307	242	—		
Pira Lilla,	308	210	2		
Cockatoo Valley	309	154	17	606	
	310	182	66		
	311	149	41		
	312	213	4	544	1,150
J. C. Reedman,	313	200	11		
51 Gilbert Street,	314	153	30		
Gilberton	315	223	10	576	
	316	142	2		
	317	274	5		
	318	238	—	654	1,230
J. G. Hamilton,	319	85	1		
119 Portrush Road,	320	192	18		
Glenside	321	157	54	434	
	322	147	6		
	323	143	1		
	324	225	—	515	949
F. M. Pearce,	325	250	4		
Box 2, Burra North	326	86	8		
	327	213	55	549	
	328	261	1		
	329	180	—		
	330	174	32	615	1,164
M. C. Wilson,	331	2	—		
1 Jetty Road, Grange	332	289	1		
	333	204	1	495	
	334	234	1		
	335	246	1		
	336	died		480	975
C. H. Lines,	337	234	5		
87 Seventh Avenue,	338	204	5		
St. Peters	339	127	1	565	
	340	170	5		
	341	235	2		
	342	166	10	571	1,136
F. A. Langley,	343	209	1		
122 Torrens Road,	344	202	—		
Kilkenny	345	123	—	534	
	346	193	—		
	347	187	35		
	348	162	3	542	1,076
R. C. Scudds,	349	89	24		
Bordertown	350	218	11		
	351	177	26	484	
	352	127	22		
	353	134	44		
	354	200	—	461	945
H. J. Mills,	355	220	—		
108 Edwards Street,	356	died			
Edwardstown	357	201	45	421	
	358	182	6		
	359	63	5		
	360	178	56	428	844
G. Wormald,	361	216	46		
Pooraka	362	111	113		
	363	80	50	407	
	364	48	144		
	365	223	—		
	366	111	4	382	789

Section 1.—Wet Mash—*continued.*

Class 3.—Black Orpington—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
H. W. C. Aubertin,	367	died			
Maurice Road,	368	187	24		
Murray Bridge	369	176	2	363	
	370	68	143		
	371	died			
	372	115	44	183	546
Scottsburn Stud	373	246	3		
Poultry Farm,	374	206	8		
Echunga	375	201	9	653	
Sweeney Bros.,	376	259	6		
55 Rundle Street,	377	183	2		
Ararat, Victoria	378	208	—	650	
H. W. and R. D. Pearce,	379	226	1		
Lobethal	380	248	5		
	381	165	1	639	
A. P. Urlwin,	382	50	3		
Box 80, Balaklava	383	187	13		
	384	died		237	
E. T. J. Trenorden,	385	159	17		
57 Kyle Street,	386	229	1		
Glenside	387	202	—	590	
A. J. Waugh,	388	225	18		
Helm Road,	389	187	2		
Kangaroo Flat, *via*	390	179	1	591	
Bendigo, Victoria					
Merv. Smith,	391	232	8		
37 Scott Street,	392	111	93		
Parkside	393	255	8	598	
Colin J. Easther,	394	142	40		
3 Fairmont Street,	395	203	7		
Black Forest	396	231	1	579	
Wilkinson Bros.,	397	88	3		
Ben Nevis, *via*	398	149	3		
Ararat, Victoria	399	136	—	373	
J. Morrow & Son,	400	249	-		
82 Augusta Street,	401	206	18		
Glenelg	402	266	3	721	

Class 4.—Light Sussex (30 *Birds Competing*).

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
F. A. Langley,	403	died			
122 Torrens Road,	404	150	—		
Kilkenny	405	85	49	235	
	406	170	86		
	407	104	65		
	408	died		274	509
B. H. Leonard,	409	95	131		
Bracknell, Tasmania	410	93	94		
	411	197	29	385	
	412	199	2		
	413	130	35		
	414	114	70	443	828
Ben R. Hart,	415	106	65		
Uraidla	416	174	1		
	417	184	29	464	
	418	90	58		
	419	died			
	420	27	96	117	581

Section 1.—Wet Mash—*continued.*

Class 4.—Light Sussex—continued.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
H. W. and R. D. Pearce,	421	141	14		
Lobethal	422	58	1		
	423	died		199	
F. V. Alvey,	424	178	—		
Rowlands Road,	425	153	85		
Magill	426	51	7	382	
Rex Kidman,	427	162	3		
"Camberwarra,"	428	80	68		
Lower Light	429	121	41	363	
Wilkinson Bros.,	430	84	80		
Ben Nevis,	431	122	11		
via Ararat, Victoria	432	died		206	

Class 5.—Rhode Island Reds and Langshan. (30 *Birds competing*).

Langshans.

Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
C. H. Lines,	433	152	—		
87 Seventh Avenue,	434	242	—		
St. Peters	435	249	8	643	
	436	256	3		
	437	165	—		
	438	158	2	579	1,222

Rhode Island Reds.

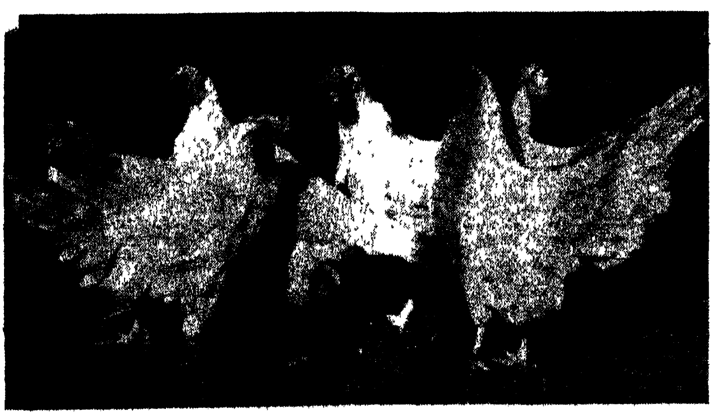
Competitor.	Bird No.	First Grade Eggs.	Second Grade Eggs.	Trio.	Team.
E. J. Cawthorne,	439	145	1		
Hanson	440	157	2		
	441	165	1	467	
	442	175			
	443	138	1		
	444	65	10	378	845
Scottsburn Stud	445	184	59		
Poultry Farm,	446	93	185		
Echunga	447	96	78	373	
H. W. and R. D. Pearce,	448	died		—	
Lobethal	449	186	-		
	450	239	—	425	
Rex Kidman,	451	169	—		
"Camgerwarra,"	452	165	4		
Lower Light	453	186	—	520	
A. Perkins,	454	188	—		
5 Eastgate Street,	455	171	3		
Pascoe Vale South	456	102	1	461	
Eric F. Snow,	457	189	—		
18 Mount Barker	458	52	24		
Road, Glen Osmond	459	131	1	372	
D. McKay,	460	245	6		
Hillcroft Poultry	461	118	5		
Farm, 47 Landells	462	143	21	506	
Road, Pascoe Vale,					
Victoria					

SECTION XI.—WET MASH—HOME PROJECT UTILITY WORKERS.

Class 6.—Any Breed (39 Birds Competing).

FINAL SCORES—1ST APRIL, 1946 TO 31ST MARCH, 1947.

Competitor.	School.	Breed.	Bird No.	No. of First Grade Eggs.
Robert Phelps	Urrbrae High	White Leghorn	463	206
John Gay	Urrbrae High	White Leghorn	464	190
Colin Wormald	Pooraka	White Leghorn	465	34
Kevin Wormald	Pooraka	White Leghorn	466	106
Allan Wormald	Pooraka	White Leghorn	467	90
Brian McInerney	Glenelg	White Leghorn	468	201
Mary McInerney	Glenelg	White Leghorn	469	30
John McInerney	Glenelg	White Leghorn	470	183
Kevin McInerney	Glenelg	White Leghorn	471	213
John Cranwell	Glenelg	White Leghorn	472	127
Barry Tydeman	Glenelg	White Leghorn	473	202
John Oliver	Glenelg	White Leghorn	474	228
Bryon Cave	Glenelg	White Leghorn	475	214
Joan Machell	Plympton	White Leghorn	476	150
Dave Wormald	Pooraka	Black Orpington	477	116
Colin Wormald	Pooraka	Black Orpington	478	168
Kevin Wormald	Pooraka	Black Orpington	479	161
Allan Wormald	Pooraka	Black Orpington	480	195
Ian Gordon	Westbourne Park	Black Orpington	481	235
Don Jamieson	Westbourne Park	Black Orpington	482	138
David Cain	Westbourne Park	Black Orpington	483	171
Beth Cain	Westbourne Park	Black Orpington	484	120
Richard Osborne	Westbourne Park	Black Orpington	485	151
Ron Cole	Westbourne Park	Black Orpington	486	214
Clarrie Henry	Westbourne Park	Black Orpington	487	199
Monty Brown	Glenelg	Black Orpington	488	134
Richard Robinson	Hanson	Black Orpington	489	174
D. K. Cawthorne	Hanson	Black Orpington	490	244
J. A. Cawthorne	Hanson	Black Orpington	491	140
D. C. Cawthorne	Urrbrae High	Black Orpington	492	140
Colin Hollow	Urrbrae High	Black Orpington	493	240
Elaine Schroeder	Middleton	Black Orpington	494	183
Brian Hentschke	Brinkworth Area	Black Orpington	495	276
G. P. O'Reilly	Woodville	Black Orpington	496	182
Norman Barnett	Westbourne Park	Rhode Island Red	497	193
Katherine Robinson	Hanson	Rhode Island Red	498	183
Edward Heinicke	Brinkworth Area	Rhode Island Red	499	160
Brian France	Brinkworth Area	Light Sussex	500	142
Eric Dixon	Woodville	Light Sussex	501	147



The leading White Leghorn team of Mr. H. J. Gwynne which attained the record score of 1,845 first grade eggs.

K. M. STEVENSON, Government Printer, Adelaide.

THE AGRICULTURAL GAZETTE FOR AUGUST, 1947.

This Issue Contains:—

Editorial—

A Vigorous Export Drive.

A VIGOROUS drive to maintain and expand export markets for primary products is urgent and vitally essential to our continued prosperity.

Australia's exports of primary products in 1945-46—mainly wheat, wool, dairy products, meat, fruit and eggs—were worth £(A)130,000,000, or 60 per cent. of the total value of our export trade.

The fact that we have selling contracts with the United Kingdom for most of our export surpluses for the next eighteen months or so does not assure the future. With her war-drained financial resources, and the probability of a gradually decreasing population, the United Kingdom may be able to provide, in the near future, only a dwindling market for our primary products—a market which it is likely we will have to share with other countries.

In looking elsewhere to expand our markets we must be prepared to meet with intensive competition from other exporting countries. We shall meet similar competition, too, in a bid for continued markets in the United Kingdom when our present contracts expire.

At present there is a scarcity of consumer goods throughout the world. That makes selling easy. It also makes sellers careless in maintaining quality standards, careless in the packaging of export goods and careless in the matter of publicising or advertising Australia's products overseas in markets which seem already assured.

It is essential, however, that we keep our export goods constantly under the notice of overseas buyers; not only must we impress importers and retailers, but we must also capture the imagination of the individual purchaser to an extent that Australia's trade mark on export goods means the same thing to him as quality and good value for his money.

These points were emphasised recently by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), who said it was surprising that, whereas the retail trade had found it constantly necessary to advertise in order to maintain turnover, and had proved the selling power of effective window-dressing, packaging and "get-up," a similar policy had not been followed generally by Australian exporters to capture the tastes of the buying public overseas. It was vitally important to realise those shortcomings and rectify them immediately, otherwise we had a slender chance of competing with countries which showed more imagination and initiative.

We could with advantage, said Mr. Graham, follow the example of those countries which staged exhibits in overseas centres. Films, also, should be used to highlight our production and manufacturing methods, and we should cultivate a better public relationship with the overseas press.

All this was a job to be commenced right now. However, sight must not be lost of the fact that no matter how effective were overseas publicity and advertising, a permanent and prosperous export trade depended on quality, attractive "get-up" and continuity of supply.

Soils for Departmental Examination.

Directions for Taking Samples.

MANY requests for chemical reports on soils are received by the Department of Agriculture annually, but the value of the examination is frequently prejudiced by the sender's failure to recognise the points to be observed in the submission of a sample.

The following directions are given for the guidance of those seeking information in this connection:

Sampling should be carried out within an area of approximately uniform soil. Irregularities such as mounds and depressions, former tree sites, burnt stumps or spots where timber or rubbish have been burnt, or local spots of impaired drainage should be avoided. If more than one soil type occurs within a prospective cultivation or pasture area, each soil type should be sampled separately.

A hole to a depth of a foot should be dug with a spade, one side trimmed up to present a straight vertical face and any changes in the soil section noted. A slice about 1 inch thick can be shaved off the straight face down to the level of any obvious change in colour or texture. A clay subsoil, for example, at 8 inches depth, should not be included with the surface 8 inches of loam, the slice extending in this case only to a depth of 8 inches. If the soil is deep and no change is noted, a slice down to about 10 inches can be taken.

Several slices of similar size may be taken at different spots within the same soil type, well mixed, after breaking up, by rolling backwards and forwards on a large bag, and a half pound selected for despatch. If the sample is wet it should be spread to dry before placing in it a container.

Samples collected may be forwarded in tins, boxes or cloth bags, and should be addressed to the Chief Chemist, Department of Agriculture, Farrer-place, Sydney. The parcel should be marked "Soil Sample" and the name and address of the sender should be clearly written on it. A covering letter should also be sent to the Chief Chemist, containing the following particulars:

(1) Area of which the sample is typical.
(2) Nature of the subsoil—clay, rock, gravel, etc.
(3) Situation of the land and whether well drained or not.
(4) Crops to be grown.
(5) Cropping history (if any) and fertiliser treatment.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Condobolin (N. J. Hanlin)	August 5, 6
Albury Sheep Show and Fair (A. G. Young)	August 5, 6, 7
Trundle (W. A. Long)	August 12, 13
Peak Hill (C. McDowall)	August 19, 20
Parkes (S. L. Seaborn)	August 25, 26, 27
Young (Thos. A. Tester)	September 2, 3
Wagga (G. Dewey)	September 2, 3, 4
Forbes Show and Sports Day (E. R. Woods)	September 6
Corowa (W. T. Easdown)	September 12, 13
Leeton (L. C. Tweedie)	September 23, 24
Walbundrie (C. Leischke)	October 1
Hay (G. Johnston)	October 3, 4
Albury Annual Spring Show (A. G. Young)	October 7, 8, 9
Kyogle	October 8, 9
Lismore National	October 14, 15, 16
Alstonville	October 22, 23
Holbrook (Thelma Stewart)	October 24, 25
Murwillumbah	October 29, 30
Mullumbimby	November 5, 6
Bangalow	November 12, 13
Nimbin	November 19, 20

1948.

Bega (Jas. Appleby)	February, 26, 27, 28

The Influence of—

CHANGING CONDITIONS IN THE RURAL WORLD

DISCUSSED AT THE AGRICULTURAL BUREAU STATE CONFERENCE.

THE Twenty-fourth Annual State Conference of the Agricultural Bureau was held at Hawkesbury Agricultural College from 15th to 18th July. The theme of this year's conference was "The Rural World is Changing Too" and the programme was designed to awaken producers to the influences of the changes on the primary industries and on the lives of rural people. It aimed at doing this by means of addresses, demonstrations, debates, discussions, and film screenings—and the delegates who attended gained much useful information to take back to their local branches.

The conference was officially opened by His Excellency, Mr. W. J. McKell, Governor-General, who was accompanied by Mrs. McKell. The Hon. E. H. Graham, M.L.A., Minister for Agriculture and Mrs. Graham; Dr. R. J. Noble, Under Secretary and Director of the Department of Agriculture and Mrs. Noble; and representatives of many rural organisations were also present.

The Official Opening.

In officially opening the Conference, His Excellency Mr. W. J. McKell said that he proposed to put before the delegates the problem of the world's food supply and to discuss it on a global basis. It was necessary to go back to the Atlantic Charter to envisage this problem. That famous document had set the ideal of freedom from fear and want.

His Excellency traced the moves which lead to the establishment of the Food and Agriculture Organisation (F.A.O.) as a post-war development to deal with this problem. This Organisation had made surveys of the world to discover the means of supplying all peoples with not only sufficient food but with food of a desirable nutritional standard.

Meeting the needs of their peoples for food became the task of many nations in the difficult war years. Importation of new foods had been encouraged, and local production had been directed into desirable channels to enable the use of balanced rations. These activities should provide the basis of the post-war approach to the problem, said His Excellency.

Vice Royalty at the Agricultural Bureau Conference.
Their Excellencies Mr. W. J. McKell and Mrs. McKell (on right) with the General President, Mr. S. T. Parish (on left) and Hon. E. H. Graham, M.L.A., Minister for Agriculture (in centre).

Agricultural Bureau Delegates Assembled Prior to Official Opening Ceremony.

The 1947-48 Progressive Farmer Competitions.

World Tour for Selected Farmers.

IT was announced during the State Conference of the Agricultural Bureau that the Rural Bank of New South Wales had decided to conduct a Progressive Farmer Competition in 1947-48, in association with the Agricultural Bureau. Three farmers are to be selected to undertake an extensive tour, to include the United States of America, Canada and Great Britain. All expenses of the tour will be paid by the Rural Bank.

The competition winners will leave Sydney on 15th March, 1948, and arrangements are being made for them to spend six weeks in the United States, three weeks in Canada, and seven weeks in the United Kingdom.

Each member of the team will visit the most interesting districts and communities, as well as universities and other institutions where the most advanced and intensive experiments and methods are being applied, in each of the countries visited, and be able to investigate the post-war trend of primary production and marketing in his own special sphere of activity.

The team will consist of three members—one representative of mixed farming (wheat and sheep); one of the dairying industry; and the third a specialist in some branch of rural husbandry, such as pig breeding, poultry raising, fruit-growing, apiculture, etc.

All men engaged in farming or primary production in New South Wales, over the age of twenty-one years, and of such years as will assure mature judgment, with the necessary vigour to apply to advantage the lessons learned, are eligible to compete in the competition. If the entrant is not the actual owner of a farm in New South Wales, a selection committee will determine the degree to which the competitor is responsible for the production on the farm.

To ensure success of the team in representing all that is best in Australian farming community life, points will be awarded to entrants in the competition for practical ability, conservation efficiency and self expression.

Application must be made through the local Agricultural Bureau in each centre, but where there is no local branch of the Agricultural Bureau, applications may be lodged with the nearest Agricultural Society, on or before 15th September, 1947.

These applications will be dealt with by the local Agricultural Bureau or Show Society, as the case may be, and forwarded to reach the Divisional Council of the Agricultural Bureau on or before 30th September, 1947. Divisional Council recommendations must be in the hands of the competition organisers before 15th October, 1947.

The Inspection Committee's reports on the various properties associated with the entrants, will be in the hands of the State judges for the competition, by 30th November, 1947. The finalists selected will then be brought to Sydney, and face a panel of adjudicators, who will select the team of three farmers to go abroad to represent New South Wales.

Accompanying the team members on the tour will be a manager and an economist, both officers of the Rural Bank. The help of an economist when making first-hand investigation of marketing and allied problems will certainly be beneficial, and assist each member of the team in his search for basic facts of the financing and marketing of primary products.

On their return to Australia, members of the team will undertake a series of broadcasts on their experiences, observations and conclusions on what they have seen and examined in the countries they visited. They will also be required to address at least six district conferences of the Agricultural Bureau within twelve months of their return to New South Wales.

This overseas visit to world centres famous for their advanced knowledge and experimentation in the problems of primary production and marketing, by representative New South Wales farmers, with experience and full knowledge of local problems and Australian conditions, and capable of intelligently observing the relative conditions abroad, should prove of immense value, not only to the members undertaking the tour, but to the whole of the primary producers of this State.

Ministerial Party at Conference.

Left to Right.—Mr. C. A. Southee (Principal), Mr. S. T. Parish (General President), Hon. E. H. Graham, M.L.A., Minister for Agriculture, Mrs. Graham, Mrs. P. Coelli, Mrs. Andersen, Mrs. R. J. Noble, Dr. R. J. Noble, Under Secretary and Director, Department of Agriculture, Mr. C. C. Crane, Chief, Division of Information and Extension Services.

Most countries would primarily need to increase production in their own land. This involved the employment of better methods of land use, better varieties of crops, the more efficient use of modern machinery, better feeding of stock, more efficient control of disease, etc.

Next in importance was the efficient use of land now idle. This not only included land not previously used, but also land once fertile and since rendered barren by misuse, including land now being deteriorated by present methods.

These activities, to be successful, must be scientifically planned and co-ordinated and financed. In Australia we had the advantage of the advice of experts of various State Departments of Agriculture. If production was to be increased there was need for more educational and extension activities. The heart of the problem was to increase the production on individual farms.

Increased production by the farmer was dependent on receipt of a fair return, while at the same time the consumer must have sufficient purchasing power. Thus we needed a balanced economy.

With plenty of food in Australia we were inclined to think that the problem only related to other countries. The fact was that Australia belonged to F.A.O. and was solemnly pledged to take all necessary steps to assist in the world problem.

The 1930's had shown the failure of action by individual nations. Even in the United States of America, where great work was being performed, this applied.

Australia was, of course, a great food producing country but there was certainly no room for complacency and we should set about the task of improving our production by the adoption of better methods.

In conclusion, Mr. McKell said that it was an essential task that the world should produce the volume and kind of food adequate for the needs of all peoples of the world. It had been shown that the world had the technical and economic knowledge to overcome the present state of affairs. It was a work in which all could co-operate and each individual farmer had his part to play.

The President's Annual Report.

In his Annual Report, the General President, Mr. S. T. Parish, expressed his pleasure at the current buoyancy of interest throughout the Agricultural Bureau, evidenced by the very representative attendance of delegates at the Conference. "Our Executive" he said "with very deep regret has been obliged to turn away, because of inability to accommodate them, almost as many potential applicants as are actually present here to-day."

He reported that during the year many successful divisional conferences had been held with attendances of delegates varying from 120 up to 300. Many new branches had been formed during the year, particularly in the Upper Hunter Division.

Successful field days had been held—such as the combined Agricultural Bureau and Junior Farmers' Club gathering to inspect irrigated pastures at Glennifer, when 800 persons attended, and the field day at Arcadia when 300 farmers from the "Hills" District had been present at an orchard and farm mechanisation demonstration.

A number of Bureau branches had conducted film evenings at their meetings, and some had purchased their own projectors for this work. Youth schools had been a prominent feature of the year's work, and many other activities of value to rural communities had been successfully carried out.

Delegates Arriving at the Memorial Hall in which General Sessions were Held.

Highlights of the Programme.

Highlights of the three-day programme, packed with interesting sessions for men as well as women delegates included the addresses given by Mr. C. C. Crane, Chief of the Division of Information and Extension Services, Department of Agriculture, on "We Live in a Changing World" in which he dealt with the great acceleration of scientific discovery and invention in recent years and the influence of these changes on the primary industries; and that given by Professor J. R. A. MacMillan,

Dean of the Faculty of Agriculture of Sydney University, on "Science in Agriculture" in which he discussed the role of the University in the conduct of agricultural research and indicated the co-operation which could be given by farmers and by farmers' organisations.

Mr. Max Henry, who recently retired from the position of Chief of the Division of Animal Industry of the Department of Agriculture spoke on "The Livestock Industry in a Changing World"; Professor Wadham of the University of Melbourne, who delivered the 1947 Farrer Oration, took as his subject "Problems in Adjustment in Agricultural Development"; and a symposium on "Wool in a Changing World" was given by Dr. P. R. McMahon of Sydney Technical College, whose subject was "Development in Wool Technology;" and Mr. A. R. Penfold, who spoke on "Trends in Synthetics."

Panel Discussions and Debates.

An item of particular interest to wheat farmers was the panel discussion on "The Future of the Wheat Industry" staged by a team comprising Mr. J. R. Fisher, Cereal Chemist of the Department of Agriculture (leader); Mr. J. Cavanagh, Wheat Growers' Representative on the Australian Wheat Board; Mr. L. Sloane, Council of the Bread Manufacturers' Association; Mr. C. V. Janes, Economist; and Mr. L. Jones, Miller, of the Chemists Branch of the Department of Agriculture.

The main feature of one evening session was a debate which was of value, not only because of the information given on the subject, which was "Stubble Mulch Farming Should Replace Bare Fallow Farming," but also because of the demonstration given of the technique of debating. Other items of interest on the evening programmes were play readings by Bureau delegates, concert items and the screening of educational films.

Practical sessions were held on several mornings at which demonstrations were given, among which were pruning of trees and vines, carcase appraisal of pigs, Mule's operation on sheep for the prevention of blowfly attack and on the topping of a hay stack.

Items of Interest to Rural Women.

The special interests of farm women folk were catered for at separate sessions. Items of particular importance on these programmes included talks and demonstrations on such subjects as "Use of Furniture in the Home" by Miss N. Foskett, Extension Officer, Department of Agriculture; "Good Carriage" by Miss Eunice Gill, Assistant Director of Physical Education; "Home Millinery"—a demonstration by Mrs. G. Downes of Kulnura; "Curing and Tanning Skins on the Farm" by Mr. F. A. Coombs; "Packed Lunches"—a demonstration by Miss W. Wilson, Dietician of the Department of Public Health; "Preserving Eggs by Pasteurisation" by Mr. T. Murphy, Bacteriologist, Department of Agriculture; a fruit preserving demonstration by Miss June Chancellor, Fruit Preserving Instructress of the Department of Agriculture; and a talk on programmes for women's extension work by Miss Lorna Byrne, Senior Extension Officer of the Department of Agriculture.

Approved Vegetable Seed—August, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereington," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

A Percheron Stud Established

At Wagga Experiment Farm.

A PERCHERON stud is to be established by the Department of Agriculture at Wagga Experiment Farm. This stud will be headed by the imported Percheron stallion, "Kilham Commando," which was purchased in England last year by the New South Wales stud stock buying delegation, which was led by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.).

Two Percheron mares, "Kadlunga Yalgoo" and "Kadlunga Zara," have been purchased for the Wagga stud from the well-known Percheron breeder Mr. A. J. Melrose, Mintaro, South Australia. A third mare, "Jou Jou," was purchased in England from Sir Alfred Goodson. She is unrelated to "Kilham Commando." A fourth mare should reach Australia from England towards the end of this year.

Foaled in 1942, "Kilham Commando" is an attractive dapple grey, standing 17.1 hands high. His progeny was seen on the estate of Sir Alfred Goodson, Mindrum, Northumberland, England, from where the stallion was purchased.

This stallion will also be bred to selected mares in the Department's Clydesdale stud at Wagga Experiment Farm, and, in

The Imported Percheron Stallion "Kilham Commando."

addition, will service suitable mares in the surrounding district.

It was confidently expected, said the Minister, when making this announcement, that the founding of a high class Percheron stud in New South Wales would stimulate breeding of good horses. The Percheron was not well-known in Australia, although it was the most popular breed of draught horse in the United States of America and Canada. In England and Scotland also, the Percheron was well established and fast gaining in popularity.

There was still a big demand, said Mr. Graham, for farm utility and delivery horses of good conformation, hardiness and tractableness. The Percheron and its crosses answered all those requirements. Too many unattractive and mongrel types were being bred to-day, for which there was very little demand.

Special School for Dairy Factory Operatives

At Hawkesbury Agricultural College.

Group taken at the Special School ror Dairy Factory Operatives Held at Hawkesbury Agricultural College, July, 1947.

The School was held in response to a request from the industry (in particular the New South Wales Section of the Australian Association of Dairy Technology), asking that opportunity to receive instruction in modern dairy factory practice, be given to operatives unable to take the College Diploma Course. Factories throughout the State were represented.

Seated in the centre of the front row are the College Principal (Mr. E. A. Southee), Hon. E. H. Graham, M.L.A. (Minister for Agriculture) and Mr. J. D. L. McGibbon, Special Dairy Officer.

The Way to—

BETTER PASTURES IN THE CENTRAL WEST.

(*Continued from page* 343.)

B. D. AMENT, H.D.A., Agrostologist.

IN the first instalment of this article, which appeared last month, the author described the history of the development of pasture improvement in the Central West, the benefits of the practice in these areas and the latest methods of improving natural pastures.

In this continuation he deals with the sowing of pastures on non-arable land and with the establishment of permanent pastures on arable land. The article will be continued in future issues.

TYPES OF IMPROVEMENT—*contd.*

Sown Pastures—Non-arable land.

The usual method of improving non-arable country in the Subterranean clover region, is to mix clover seed at the rate of 1 or 2 lb. per acre with superphosphate at from ½ to 1 cwt. per acre, and apply through a rotary type broadcaster in the late autumn, preferably April. Where no cultivation is possible, an earlier application is inadvisable because of the risk of seedlings burning off before becoming well established. It is also desirable to remove stock from the country to be so treated to allow as much grass topgrowth to develop as possible. This topgrowth provides shelter for the clover seedlings.

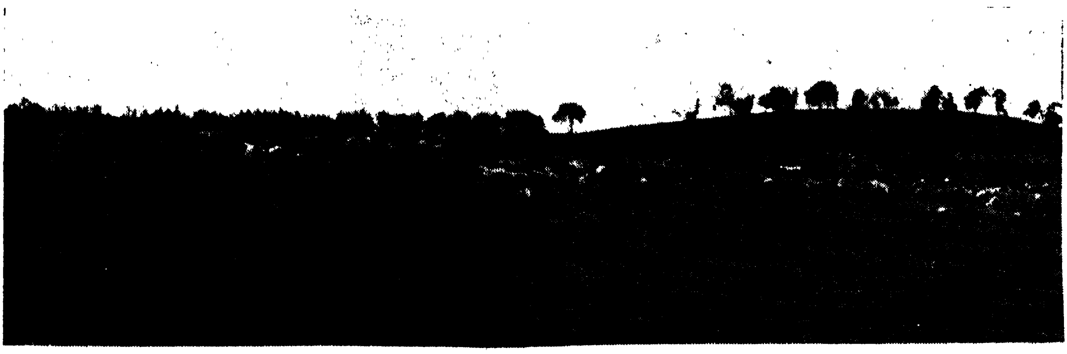
This method can be used on any country on which a broadcaster can be driven. Complete clearing is not essential; it may only be necessary to clear tracks for the machine. The clover is comparatively slowly established and any cultivation, even though it may be rough, will assist the process.

SOWN PASTURES—ARABLE LAND.

Permanent Pastures.

The most suitable type of pasture, or pasture mixture, which may be sown on arable land will depend on a number of factors—climate, soil, its main purpose and economic considerations. The mixtures recommended in this article should be regarded as standards, which can be considerably modified to suit varying conditions. Rainfall is of paramount importance (no provision is made in this article for irrigated pastures), for soils can be somewhat modified where rainfall is adequate. For instance, the districts regarded as safe for Subterranean clover are those with an average rainfall of 25 inches or more. However, this is not a hard-and-fast rule, as this clover has been successfully grown in areas with a lower rainfall, but usually only on the lighter textured soils (see accompanying map).

Soils vary considerably, particularly on the tablelands, not only from district to



Ewes and Lambs on a Perennial Rye-Subterranean Clover Pasture in the Orange District.

district, but from paddock to paddock, and even within the paddock, and while some species can thrive on a wide range of soil types, others are comparatively restricted.

The purpose for which the pasture is to be used will be of importance if it is intended mainly for hay production, for example lucerne, or for seed production. This aspect will be referred to later, and in this section of the article it will be assumed that the pasture is intended mainly for grazing by sheep or cattle.

It is often desirable or necessary to reduce the per-acre cost to an absolute minimum; the high price and scarcity of seed may make it necessary to reduce the rate of sowing to a minimum. Where these apply, it must be remembered that with most of the perennials, *e.g.*, lucerne and *Phalaris tuberosa*, the amount of good seed sown will determine the density of the pasture throughout its life. Thus there is no great scope for reduction with these species if a satisfactory result is to be obtained. With free-seeding annuals such as Subterranean clover and Wimmera Rye grass, however, the position is quite different. No matter how much or how little seed is sown they will eventually build up to a dense pasture, given favourable conditions. The lighter the sowing of course, the longer time it will take to achieve the result. Either of these species may be sown at a rate as low as ½ lb. per acre, but, particularly with the clover, it is desirable to sow considerably more than that.

All pasture mixtures should include at least one legume, for a number of reasons. Legumes provide fodder of comparatively high protein content to balance that provided by grass, which is comparatively high in carbohydrates and low in protein. The ideal mixture is approximately 60 per cent. grass and 40 per cent. clover. Legumes also enrich the soil with nitrogen and organic matter and so stimulate the growth of the grasses and other fodder plants.

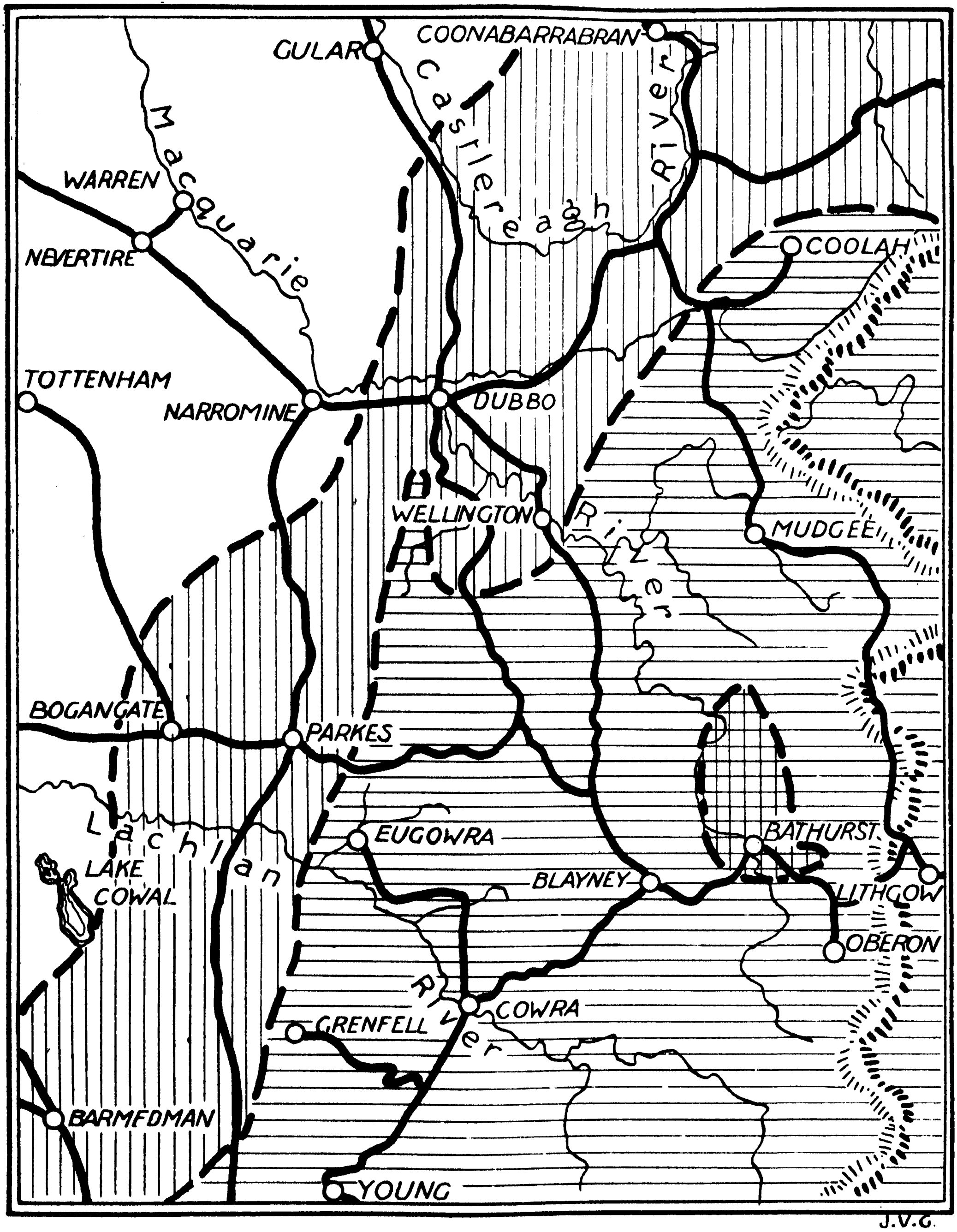
On the Central Tablelands, Subterranean clover has been so successful that it has almost entirely replaced all other legumes, such as Red and White clovers and lucerne, and it is seldom that a pasture is sown without it. In the drier areas, lucerne is still the "King of Fodders" and is the main legume sown, but Ball clover and trefoils such as Barrel clover could be more widely used with success.

Mixtures Recommended.

(All rates on a per-acre basis.)

1. *Central Tablelands (except Bathurst)*—
   - (*a*) Rich heavy soils, creek flats, etc.
     - (1) Perennial Rye grass (certified permanent pasture) .. .. 8 lb.
       Midseason Subterranean clover .. .. .. 4 lb.

       On damp flats 1 lb. of White clover and 1 lb. of Strawberry clover may be used instead of the Subterranean clover.
     - (2) *Phalaris tuberosa* .. 3 lb.
       Midseason Subterranean clover .. .. .. 4 lb.
   - (*b*) Medium quality soils—
     - (3) *Phalaris tuberosa* .. 2 lb.
       Midseason Subterranean clover .. .. .. 3 lb.
   - (*c*) Poor soils—
     - (4) Midseason Subterranean clover .. .. .. 2 lb.
       Wimmera Rye grass .. 2 lb.
2. *Bathurst Area*—
   - (*a*) Rich flats—
     - (5) Lucerne .. .. 8 lb.
     - (6) Lucerne .. .. 4 lb.
       Phalaris tuberosa .. 1 lb.
       Subterranean clover (Midseason) .. .. 2 lb.
       Subterranean clover (Early strain) .. .. 1 lb.
   - (*b*) Upland granites—
     - (7) Lucerne .. .. 3 lb.
       Wimmera Rye grass .. 1 lb.
       Subterranean clover (Early strain) .. .. 1 lb.
       Subterranean clover (Midseason strain) .. 2 lb.
3. *Nearer Central Western Slopes*—
   - (*a*) Lighter soils—as for (4) above.
   - (*b*) Heavier Red soils—
     - (8) Subterranean clover (Early strain) .. .. 2 lb.
       Ball clover .. .. 2 lb.
       Wimmera Rye grass .. 2 lb.



SUBTERRANEAN CLOVER AREAS OF THE CENTRAL TABLELANDS AND CENTRAL WESTERN SLOPES.

Zone in which midseason strain can be grown successfully.

Zone in which midseason strain cannot usually be grown successfully but in which earlistrain will grow, except on some of the heavier soils.

The Bathurst zone in which it is recommended that a mixture of midseason and earlistrain be sown.

(*c*) Heavier Black soils—

(9)	Lucerne	3 lb.
	Phalaris tuberosa ..	1 lb.

4. *Outer Central Western Slopes*—

(*a*) Light Sandy soils —

(10)	Barrel clover	2 lb.
	Lucerne	2 lb.
	Rhodes grass	2 lb.
	Wimmera Rye grass ..	1 lb.

(*b*) All other soil types—

(11)	Lucerne	2 lb.
	Wimmera Rye grass ..	1 lb.

Notes on the Pasture Species.

Subterranean clover (*Trifolium subterraneum*).—The Midseason strain of Subterranean clover mentioned so often in this article is the wonder plant of the 25-inch and over rainfall country of the Central Tableland and Central Western Slopes. First sown in this district about twenty years ago, it is now well established on many thousands of acres, and certified seed is produced on a commercial scale, mostly in the Blayney district.

It is a free-seeding, vigorous-growing annual. Seed germinates with late summer and autumn rains and the plants grow through the winter, eventually sending out long runners and flowering and setting seed from the beginning of September till November. They die off between the end of November and early January. This clover soon becomes very dense and provides a large bulk of highly nutritious fodder throughout the winter and spring. It makes excellent quality hay and yields up to 4 tons of hay per acre in a single cut. It is outstanding as a soil enricher and for control of soil erosion. The Midseason strain will grow well on practically any soil in this region where the rainfall is 25 inches or more, and on the lighter soils in the 22 to 25 inch region.

Earlistrain can be grown on the lighter soils in the 20 to 22 inch region.

Red clover (*Trifolium pratense*).—Mainly a spring and summer grower, and although generally considered as a perennial it has a productive life of three to four years. In better rainfall zones it has been useful on good soils in mixtures to provide early grazing until the other clovers become established and also for short term pastures in rotation with such crops as potatoes. Owing to the success of Subterranean clover, its ease of establishment and permanence, and the fact that seasonal conditions since 1939 have not been favourable for good results with Red clover, this species has been largely superseded. Even with the return of more favourable conditions, Red clover could play only a minor part compared with Subterranean clover.

White clover (*Trifolium repens*).—A truly perennial clover which has the advantage over the annual clovers of providing green feed during the summer. It thrives only on the best soils where moisture is plentiful and may disappear during prolonged dry spells.

Strawberry clover (*Trifolium fragiferum*).—A perennial that thrives only in very moist places, where it provides excellent feed all the year round. As seed is expensive only small quantities of ½ to 1 lb. per acre are sown.

Ball clover (*Trifolium glomeratum*).—An annual, more dry weather-resistant than Subterranean clover and occurs throughout the tablelands and more favoured parts of the slopes. Useful on the heavier soils of the inner slopes where, on certain soils, Subterranean clover and lucerne do not thrive.

Barrel clover (*Medicago truncatula*).—An annual legume somewhat similar in growth to the Burr trefoils, but which produces a hard, barrel-shaped seed pod that does not readily adhere to wool. It has been successful on parts of the slopes.

Lucerne (*Medicago sativa*).—The "King of Fodders" on the slopes and plains in rainfall districts of 18 inches and over. It is very valuable both for grazing and hay production, and is drought-resistant and long-lived if correctly managed.

Wimmera Rye (*Lolium rigidum*).—A vigorous, free-seeding annual which grows rapidly, and provides a large bulk of feed and a remarkable amount of seed. It is very dry weather-resistant and can be grown successfully practically anywhere on the slopes and tablelands, and the better rainfall areas of the plains. It has the disadvantage that it tends to disappear from a pasture after about two years under normal grazing conditions, particularly on soils which tend to set, unless some form of

A Thin Lucerne Stand in the Cowra District Responds to Renovation and Top-dressing. No treatment on the right.

surface cultivation is carried out to provide a better seed bed.

Italian Rye (*Lolium multiflorum*).—This is a vigorous-growing annual which, under favourable conditions, produces a great bulk of nutritious feed during winter and spring. It could be useful sown with Red or Subterranean clover in a short term pasture in rotation with crops on the tablelands; this grass is not as hardy as Wimmera Rye.

Perennial Rye grass (*Lolium perenne*).—A long-lived perennial which, under favourable conditions, provides succulent, highly nutritious feed. Requires good soil under comparatively high rainfall and is not very dry weather-resistant. Considerable areas of this grass have died out on parts of the Central Tableland during recent dry summers.

Toowoomba Canary (*Phalaris tuberosa*).—One of the most perennial of all grasses producing an abundance of long, broad leaves; in pliable soils it develops large crowns and is very deep-rooted. It is affected by competition from other grasses in its early life, is very hardy once established and comparatively dry weather resistant. It grows to perfection on deep black soils with a plentiful supply of moisture, but is successful on a wide variety of soils and on rainfalls as low as 20 inches. This species provides grazing throughout the year.

This grass is sometimes criticised because if allowed to become rank, sheep do not eat it readily. Seed is usually expensive, but sowings of 1 lb. to 3 lb. per acre are usually ample. Very good quality seed has been produced on the Central Tablelands in commercial quantities and the prospects in this direction are excellent.

Cocksfoot (*Dactylis glomerata*).—A perennial grass which has not given good results compared with either Perennial Rye or *Phalaris tuberosa,* except on certain white, pipe-clay soils in high rainfall areas such as parts of the Oberon district. Apart from these isolated exceptions it is not now grown.

Kikuyu grass (*Pennisetum clandestinum*).—A perennial, summer-growing grass which spreads by runners both above and below ground surface, forming a dense mat of foliage. Where conditions are favourable it produces a very large bulk of highly nutritious and palatable feed during the warmer months. It is drought resistant and is browned off, but not killed out by frost. It is suitable for lawns on the slopes and

plains, and, because of its habit of forming a dense mat of runners and foliage, is excellent for controlling erosion in gullies and for use on banks of dams.

As seed is only formed on rare occasions, Kikuyu is propagated from runners. This fact alone prevents it from being extensively sown as a grazing plant.

Rhodes grass (*Chloris gavana*).—A summer-growing perennial grass which spreads both from seed and, to an extent, by runners. Grows well on light sandy soils in parts of the slopes.

Use of Cover Crops.

Whether pasture seeds should be sown with a cover crop of wheat or oats is quite a contentious matter, but results in all districts over quite a number of years have enabled definite recommendations to be formulated. Despite this, there are many factors which may affect results, and methods which bring success one year might produce failure under different conditions.

Vigorous annuals such as Subterranean clover and Wimmera Rye grass, and even Perennial Rye grass, are usually quite successfully established with a cover crop, provided the recommendations set out below are followed. *Phalaris tuberosa*, however, should never be sown with a cover crop, as it will not stand up to competition from the crop during the critical establishment period.

While it is not generally recommended that lucerne be sown with a cover crop, it is realised that many thousands of acres of grazing lucerne have been successfully established this way, while on the other hand there have been many failures. If successful, the cost of establishing the lucerne is merely the price of the seed, the crop usually more than covering all other costs. In the event of failure, the loss is the price of the seed plus twelve months' lucerne production. These factors, plus prevailing climatic conditions, must be considered in deciding for or against a cover crop.

In any case where pasture seeds are sown with a cover crop, the following general recommendations should be followed:—

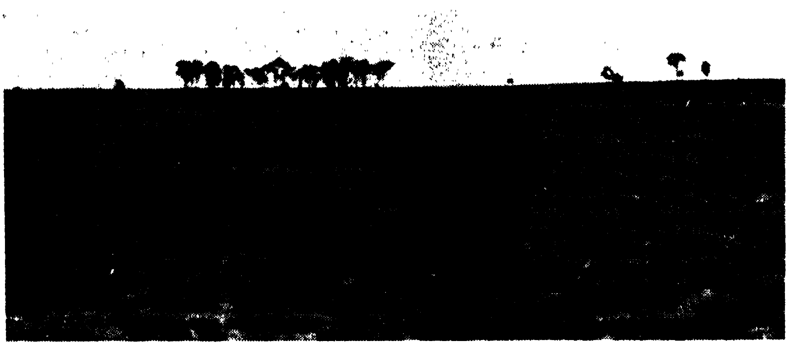
(1) Reduce the rate of sowing of the cereal to not more than two-thirds of the usual rate.

(2) Do not sow the pasture seed at the same depth as the cereal. When sowing is done through a drill or combine and the pasture seed mixed with the fertiliser, it may be necessary to make two operations, sowing the pasture seed after the cereal at the correct depth of ½ to 1 inch. Where a pasture seed-sowing attachment is available, the seed can be dropped on the surface and covered by light harrows.

(3) The pasture plants must be the main consideration when grazing off the crop, and the grazing should not be too close.

(4) The crop should be stripped for grain rather than cut for hay; the stubble then acts as protection for the pasture plants. When the crop is cut for hay, this protection is suddenly removed, and this exposure when the weather is warming up may be fatal to the tender plants. Hay cutting may prevent annuals like Wimmera Rye and Subterranean clover from forming seed.

(To be continued.)



This 3-year-old Stand of Lucerne in the Balladoran District was Sown at the Low Seeding Rate of 1 lb. per Acre.

Contribution by . . .
Chemist's Branch.

SPRAY RESIDUES ON TOMATOES.

Acid Dip Method of Removal.

THE equipment necessary consists of two or three wooden troughs or tubs in which the dipping and washing liquids are placed. These should be of sufficient size to accommodate readily the case in which the tomatoes are to be dipped. A large barrel or cask sawn across the middle will be found to provide two satisfactory tubs for this purpose. Metal or concrete containers can be employed provided they are painted inside with bituminous or other acid-resisting paint; they are not suitable otherwise since they will be attacked by the dip. Draining boards placed at the edge of the tubs and tilted so that liquid will drain back into the tubs are also required. One tub holds the acid dip which is made up at the rate of 1 gallon of commercial hydrochloric acid (commonly known as *muriatic acid) to 100 gallons of water, that is, 1 pint of muriatic acid to every 12½ gallons of water. A glass measure will be found very useful for measuring the acid. The water should first be measured into the tub, then the required amount of muriatic acid added and the dip well mixed.

A second tub contains water to which lime is added at the rate of about 1 lb. to 40 gallons of water. Good quality stone or hydrated lime should be used for this purpose; air-slaked lime is not satisfactory.

Any convenient box is suitable for holding the tomatoes while dipping (e.g., an ordinary half-bushel box) provided there is sufficient spacing between the boards to allow easy movement of the liquid and quick draining.

Dipping Procedure.

Before dipping, the tomatoes can be roughly sorted, if desired, after which they are placed in the dipping cases. A case of tomatoes is then placed, case and all, in the acid dip and kept gently moving up and down for 1 to 1½ minutes, by which time the spray residues should be removed. The case is then lifted on to the draining board so that the excess dipping liquid will drain back into the acid tub. When this has practically all drained off, the case is placed in the lime bath and kept there for about 1 minute, after which it is moved to the second draining board and the excess liquid permitted to drain back into the lime bath.

The lime dip is used to ensure that all acid is removed from the tomatoes, the lime present having the effect of neutralising or "killing" the acid. If water alone were used in the second tub, the acid solution carried over on the tomatoes and box from the acid dip would gradually make the wash liquid more and more acid. This acid liquid left on the tomatoes when they were taken from the second bath might become sufficiently strong, before long, to give rise to acid burn. For this reason active lime should always be present in the wash bath; the presence of this active lime is indicated by the formation of a thin skin on top of the lime bath when it is allowed to stand without agitation for a time. This may be looked for in the morning when the bath has been left standing overnight, and if it is not formed more lime should be added.

* Muriatic acid, before being diluted with water, is very corrosive and should be handled with care. Splashing should be avoided and it is advisable to keep handy some hydrated lime or common baking soda with which this strong muriatic acid may be neutralised or "killed" if accidentally spilt.

Provided that the instructions given are followed with reasonable care there will be no acid left on the tomatoes when they are put out to dry, and thus no danger of acid injury.

If desired, a third tub may be provided containing water only. This is then used to give the tomatoes a final rinse and so wash off any particles of undissolved lime which may remain on them when they are removed from the lime bath and which might detract from the appearance of the fruits. After the case has been removed from the lime bath and allowed to drain it is plunged into the water tub, moved up and down several times and placed on a draining board to drain off surplus water.

Drying.

After the final draining the tomatoes are dried before packing. This may be hastened by spreading the tomatoes out, and for this purpose is suggested a wire netting framework or other suitable means of support, raised from the ground, and covered with bags or hessian. If desired, a removable covering might be arranged above the frame work to protect the tomatoes from the weather if necessary.

Cracked Tomatoes.

Quick drying of sound tomatoes is highly desirable. With tomatoes which are cracked or split, quick drying is definitely essential and damage may result if not followed out.

Our attention has also been called to a condition sometimes occurring where tomatoes have a pronounced pit extending into the fruit from the point where the stem comes away from the fruit. If there are many such fruit in the batch to be dipped, it is recommended that the third tub (containing ordinary water) be used in the dipping procedure and that the fruits be allowed to dry as quickly as possible; also, if practicable, when spreading the tomatoes out to dry, see that any of those fruits with pits are turned stem-end downwards.

Keeping Up Dip Strength.

The dissolving of spray residues by the acid dip causes the acid dip solution gradually to lose strength, and this will be indicated by the fact that after a number of cases have been passed through the dip the residues will take longer to remove. For this reason it is necessary to bring the dip back to its original strength by the addition from time to time of further amounts of muriatic acid. The amount of acid required to be added could best be determined by a chemical test on the dip, but as this is not at all practical for the ordinary grower, the following method may be employed:—

On dipping the first case or two of tomatoes after the dip has been first made up, take care to notice how rapidly the spray residues are removed from the tomatoes in the dip. Then, when it becomes necessary to increase the strength of the dip, add sufficient muriatic acid to the acid dip so that the residues are now removed as quickly as at the beginning. This may be done by adding say ½ pint of muriatic acid for every 20 gallons of dip fluid in the tub, mixing well and dipping a case of tomatoes to see how the residues are removed. If removal is still slower than originally, more acid may be added. After a few trials in this manner no difficulty should be encountered in readily gauging the amount of acid to be added when the dip requires strengthening. It is desirable that a measure or small container of some type be used for measuring out the acid, and thus prevent the possibility of addition of an excessive amount of acid to the dip, which may occur if acid is poured from the bottle or jar directly into the dip liquid.

The rate at which the dip loses strength will depend on the amount of spray residues on the tomatoes and on the nature of those deposits. Also, the greater the amount of acid dipping fluid employed the more slowly will the dip lose strength.

As pointed out previously, it is essential that the lime dip should at all times contain active lime, and care should be taken to observe this.

A certain amount of the acid dip liquid is carried away out of the acid tub with each box of tomatoes dipped, and after a time it may be noticed that the level of the liquid in the acid bath has become lowered. When this is the case the acid dip should be made up to the original volume by the addition of water. This addition will cause a certain weakening of the dip and therefore muriatic acid should also be added at the rate of ¼ pint of muriatic acid for every 3 gallons of additional water (or 1 pint for every 12½ gallons of water).

(*Continued on page 416.*)

FRUITGROWING.

The Pruning of the Gravenstein Apple Tree.

E. C. CONNOR, H.D.A., Fruit Officer.

INVESTIGATION by the New South Wales Department of Agriculture has conclusively proved that "twist-free" Gravenstein trees can be produced.

Such trees have shown outstanding vigour when grown under suitable conditions, but certain very definite attention should be afforded them during their early training, if full advantage is to be taken of their particular growth habit.

As with most pome fruit trees, the Gravenstein is usually supplied from the nursery in the single rod or "whip" state, and it will be found that although medium-sized whips will give quite good results provided that they have been propagated from properly selected material, strong, vigorous growers will prove to be the most satisfactory. Fig. No. 1 shows a Gravenstein whipstick and Fig. No. 2 such a tree headed at 10-12 inches.

The ideal Gravenstein tree should be rather widely spread and somewhat open to ensure good coloured fruits, and it is thus obvious that the young tree must be headed rather lower than usual in order that good balance may be maintained.

Building the Framework.

During the following year, all basal growths, suckers and useless lateral growth should be removed regularly in order to ensure that all growth is directed into the main shoots which are to provide the initial scaffolding.

Rather heavier cutting than that usually adopted is required with this variety during the first few years of its growth to ensure strong vigorous development of limbs and

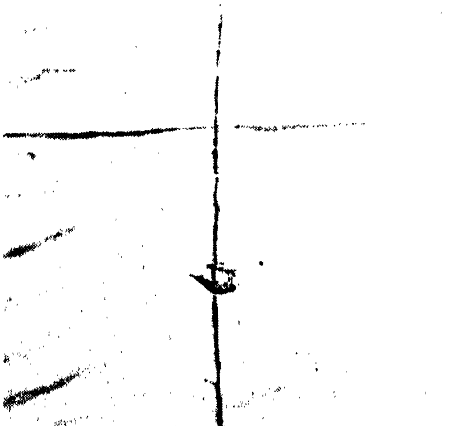


Fig. 1.—Gravenstein Whipstick at Planting.

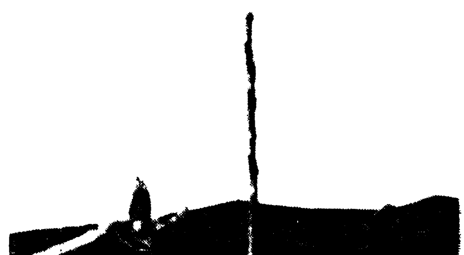


Fig. 2.—Whipstick Headed at 10-12 Inches.

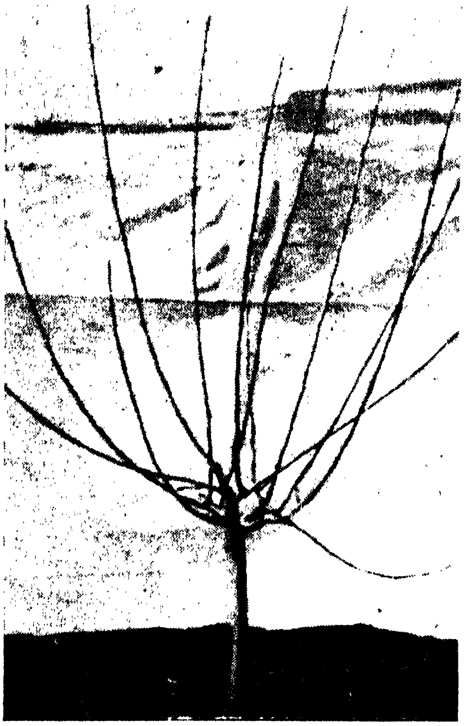


Fig. 3.—Young Gravenstein Apple Tree Two Years After Planting.

Fig. 4.—A Tree Two Years from Planting—After Pruning.

Fig. 5.—An Eight-year-old Gravenstein Tree.
Note the arrangement of the secondary limbs.

Fig. 6.—A Tree Fifteen Years Old.
Note the healthy trunk and strong scaffold of main limbs, free of twist.

laterals to facilitate the spreading of the tree. This spread may be obtained by selecting well spaced laterals for development into leaders, and removing some of the more upright growths as required.

Fig. 7.—A Fifteen-year-old Gravenstein Tree, Before Pruning.

Once a satisfactory scaffolding has been obtained, usually by the fifth year, the pruning of the Gravenstein must be moderate to light according to the vigour of the tree.

A secondary layer of limbs should be encouraged by training suitable laterals and pruning to outside buds. These limbs not only serve as protection to the main framework, but increase the potential bearing area of the tree and may be utilised to check the growth of the tree, if required, to induce early cropping.

The Development of Fruiting Wood.

During the period in which the framework is being developed it should be remembered that such limbs must be amply furnished with good fruiting wood. Continual hard cutting will tend to force lateral growth into rather strong wood. Care must, therefore, be exercised toward maintaining what lateral growth may occur, and to encourage the development of other fruiting material, particularly once the main framework has become established.

It will be found that about half to one-third of the annual growth of the leaders is removed, but all strong side laterals should be shortened to about 4 inches, unless in such position that they might tend to compete with the selected leader, in which case they should be stubbed back to the basal bud.

The following year it will be noted that most laterals shortened the previous winter will have formed one or two weaker growths and possibly a fruit bud or spur. These laterals should again be shortened back with the object of creating a permanent spur-bearing formation.

Short growths up to 8 to 10 inches long should be left untouched, unless clustered or likely to impede the fruiting capacity of the selected wood.

The terminal growth of any favourable lateral might be treated as a leader with the object of building up a good framework. At the age of about ten years, a good type of Gravenstein tree that has been correctly pruned and well grown might have anything up to twelve main limbs and another twelve secondaries arranged in circular pattern about the main framework.

Fig. 5 shows an eight-year-old tree; note arrangement of secondary limbs.

Fig. 8.—Such a Tree after Light Pruning.

Having attained a strong framework, well furnished with suitable lateral development, a lighter annual pruning must be adopted with the view to encouraging a balance between growth and blossom bud development.

In some few cases it has been found that the Gravenstein tree might even be left unpruned one season to encourage it to "settle down," but this cannot be recommended as a general practice, nor can it be recommended if the tree growth is not particularly strong, since such treatment is a very severe check upon the tree and the resultant two-year-old leader growths will be weak.

In general, it will be found that if a lighter pruning is adopted, and additional secondary leaders provided to take some of the growth, little trouble is experienced. Lateral growths might be permitted to go uncut one season, with only the stronger growths suppressed, but the unpruned leader system should only be observed after all other methods have failed, and then only with the utmost caution.

Although light pruning might be adopted to advantage, care must be exercised at all times to see that the initial framework remains well spaced and that good ventilation is maintained throughout the tree.

Being an early maturing fruit and one very liable to pre-harvest dropping, the Gravenstein must be handled along these basic lines, for although the application of hormone sprays will check pre-harvest dropping, ample sunlight must be permitted to all parts of the tree to ensure coloured fruits, and this can only be accomplished by the early formation of well-spaced, spreading limbs.

The Storage and Germination of Apple Seed.

E. C. CONNOR, H.D.A., Fruit Officer.

THE production of apple seedlings for root stock purposes is not a difficult task. Most varieties of apples produce seeds which germinate satisfactorily provided the fruits are properly matured before the extraction of the seed. Departmental field trials, however, have proved that the leading commercial varieties—Jonathan, Granny Smith, Delicious and Democrat—not only germinate well, but that seedlings of these varieties have shown to advantage in experiments in which they have been used for root stocks.

Excellent material can be produced in one year for lining out in nursery rows preparatory for budding the following season, or for bench grafting after one season's growth in the seed bed. If it is desired to raise seedling root stocks large enough for bench grafting, it is necessary to sow the seed about 3 or 4 inches apart in the seed bed. As an alternative, the seed may be sown thickly in the seed bed or in rows, and thinned out soon after the young seedlings have appeared above ground level.

Apples too small for commercial use are quite suitable for seed purposes, whilst badly bruised, hail-marked or windfall fruits also provide very good material if fully matured and not permitted to decay before the seed is extracted. Germination experiments have indicated that the viability of seed from rotted fruits is not at all satisfactory, probably on account of the alcoholic content of the decayed pulp and juice.

Extraction.

Seeds may be removed from the fruits as occasion permits, or held in the fruits until such fruits show sign of breakdown. Where only a small quantity of fruit is being handled, such fruits are best halved transversely and the seed removed with the point of the knife. Another satisfactory method is to remove the cores with a coring knife, or improvised corer, then break the core by hand. If larger quantities of fruits are being seeded it is often expedient to crush the fruits and wash away the pulp with running water.

Storage of Seed.

Regardless of the actual method of extraction of the seed, it is essential that the seeds be not allowed to dry out. Investigations carried out overseas have shown that freshly extracted apple seeds contain 85 per cent. moisture, half of which is lost during the first five days if exposed to normal room temperatures, whilst our own experiments have proved that seeds allowed to dry out by air will invariably give very poor germination.

If the seeds are extracted before planting time then they are best packed in gauze envelopes. Such envelopes are quite easily made by folding small sheets of household

flyproof gauze into say 12-inch squares, and then refolding ½-inch seams. Scraps of metal, nuts, bolts or nails should be inserted with the seed for identification purposes; a record being kept as to what each symbol denotes—variety of seed, date of extraction or other individual detail that might be of interest. The packets are then buried in moist sand, out in the open.

This stratifying of the seeds is most important. Experiments both in Australia, and overseas, have proved that the apple seed must undergo what is known as an after-ripening process if good germination is to be had. In our tableland areas, the normal winter conditions experienced are quite sufficient to complete this after-ripening process, but where the production of seedlings is contemplated under coastal or warmer conditions, it may be found necessary to have the fruits, or seeds, subjected to some six weeks at about 32 deg. Fahr. in cool chambers to ensure good viability.

If necessary to hold these seeds in cold storage, the gauze packets of seed should be stratified in boxes of moist sand with at least 2 inches of sand below and above each layer of seed packets.

Observations over a number of years have indicated that apple seeds may be kept in excellent condition up until about mid-July if stratified either under our tableland conditions or in cold storage. Seed kept later than this is very liable to germinate in the packets, and, whilst fair results may be had by planting such seed, every effort should be made to have the seed sown before this critical stage, since the young root shoot, or radicle, is very tender and quickly dries out when once exposed to the air, apart from being broken off during planting.

Seed held in common storage will, of course, commence to shoot earlier than that stratified in cold storage, particularly in the event of an early spring. Practical experience has also indicated that certain varieties are much more likely to shoot before others—the Granny Smith in particular.

Planting.

Good results may be obtained by planting the seed, under tableland conditions, in the autumn, when the seeds may be planted direct from the fruits. Such seeds should germinate before the really cold weather, and the seedlings will retain their leaves throughout the winter months.

The general practice, however, is to stratify the seed as indicated, and plant out about mid-August, or possibly a little earlier under warmer conditions. The actual time of planting is governed by the condition of the seed, as it is common for some varieties to germinate during stratification if planting be delayed too late.

Apple seeds may be sown broadcast in seedbeds and covered with about ¼ inch of finely sieved loam, then mulched with dry horse manure. Better results are to be had by sowing the seed in drills about 4 inches apart across raised beds about 4 feet wide: about fifty seeds being planted to each such row. This latter method facilitates weeding and generally results in more even germination and growth. In dryer areas it is common to cover the beds with damp bags and keep these bags moist until the seeds commence to germinate, when the bags must be removed.

As stressed previously, the seeds must be kept moist, and the seedbeds must also be kept in good condition; it is fatal to permit the seeds to dry out. Excessive watering should be avoided, however, particularly once the young seedlings are above ground level, as they are rather subject to damping off in their early stages.

Given satisfactory seasonal conditions and reasonable care, good apple seeds will give from about 60 to 80 per cent. germination. Under field trials, results at New England Experiment Farm, Glen Innes, have ranged up to 93 per cent., but such results are rather exceptional.

After-care.

Following germination, watering should be reduced to a minimum consistent with good steady growth. Weed growth must be checked.

If germination has been very high, or the seed planted too thickly, it may be necessary to thin the seedlings out slightly, but unless they are definitely required for root grafting, heavy thinning is not desirable.

Under normal conditions, it will be found that anything up to 50 per cent. of the seedlings will have attained up to ¼ inch or more in diameter at ground level by the

following autumn; the diameter would be slightly greater just below ground level. These seedlings are ideal for bench grafting, and after re-working they are, of course, planted out in the usual nursery rows.

Smaller seedlings are best transplanted, during their dormancy, into nursery rows about 3 feet apart and some 6 inches apart in the rows. After tramping them firmly into position they should be headed back to about 1 inch above ground level. The resultant growths should be trimmed to a single whipstick and budded the following February.

Diseases and Insect Pests.

Powdery mildew may cause serious losses if the seedlings are infected in their earlier stages. Fortunately this disease seldom attacks the young seedlings until rather late in the season, and, as the tops are all removed in any case, the actual damage is often negligible.

When the infection is first noted, it is recommended that the whole seedling area be sprayed with lime-sulphur at about 1 part to 150 parts of water.

Woolly aphid frequently attacks the apple seedlings, particularly when such seedlings are grown on old orchard soils or in close proximity to infested apple trees. This pest is readily controlled by spraying with 2 ounces of nicotine sulphate to 4 gallons of water. The addition of 4 ounces of soap will greatly increase the efficacy of this spray, which is best applied during the warmer part of the day.

When uplifting seedlings, bady infested plants are best destroyed, the balance thoroughly washed, then dipped in a nicotine bath. About 4 ounces of nicotine to each 4 gallons of water is the strength suggested for this dip.

Spray Residue on Tomatoes—*continued from page* 410.

Renewal of Dip.

After an acid dip has been in use for some time it becomes very dirty, and there also tends to be an accumulation of soluble arsenic and copper compounds in the dip liquid. It is advisable, therefore, when the dip becomes very dirty, to throw out the whole of the dip liquid and make up a fresh batch, using the same proportions as given for making up the original acid dip. Whenever the acid dip is thus changed it is recommended that the lime dip be also completely renewed. Indeed, if a third dip (of water only) is not employed, the lime bath can be changed with advantage more frequently than the acid dip.

Great Lakes Lettuce at Coff's Harbour.

TESTIMONY to the merits of the American variety of lettuce, Great Lakes, which promises to be of particular value in those parts of the State previously found too hot for the production of high quality summer lettuce, continues to be received by the Department.

Mr. A. K. Rippon, Coff's Harbour, has reported that the variety performed very satisfactorily under his conditions. Great Lakes was tested against Imperial 847, and in Mr. Rippon's opinion it proved to be a superior lettuce under the conditions experienced.

Great Lakes proved very resistant to the hot and humid conditions encountered and no loss was occasioned as result of seed stalk development. On the other hand, a large majority of the Imperial 847 plants went to seed.

According to Mr. Rippon the heads compared quite favourably with Imperial 847, although the leaves appeared to be tougher and better able to withstand rough handling than Imperial 847.—A. C. ORMAN, Special Agricultural Instructor.

The following mixture is recommended by the Division of Horticulture of the Department of Agriculture for painting on the trunks of fruit trees to prevent rabbits from eating the bark:

1 oz. bitter aloes; 1 lb. common soap, cut up fine; 1 gallon water.

The ingredients should be boiled for about twenty minutes, and when cool applied with a brush or swab to the butts of the trees to a height of about 2 feet 9 inches from the ground.

PLANT DISEASES

PHYTOPHTHORA DISEASE OF CITRUS

Proclaimed Under the N.S.W. Plant Diseases Act.

THE disease of citrus caused by *Phytophthora citrophthora* and other species of *Phytophthora* was declared a disease for the purpose of the Plant Diseases Act by proclamation of 25th May, 1947. A penalty is now incurred under section 26 of this Act by any person who knowingly sells or offers for sale citrus trees infected with any of the phases (collar rot, root rot or stem girdle) of the disease.

Most metropolitan nurseries are infected to a greater or less degree with *Phytophthora citrophthora*, and citrus growers establishing new areas run the risk of having infected stock supplied to them. The amount of loss suffered by the grower planting infected stock depends on the degree of infection, on weather conditions after planting and on soil type. It is possible to detect badly infected trees in the nursery, and it is possible also for nurserymen to limit the incidence and spread of the disease by selection of site, crop rotation and spraying.

The Causal Organism.

Phytophthora citrophthora is a soil-inhabiting fungus of microscopic size. There is evidence that it can persist in the soil for many years, evidently living on organic matter in competition with the normal population of harmless moulds which are always present. Under moist conditions it produces spores on the soil surface and in the soil, and these are washed or splashed by rain water on to the tree, thus spreading infection to roots and above-ground parts.

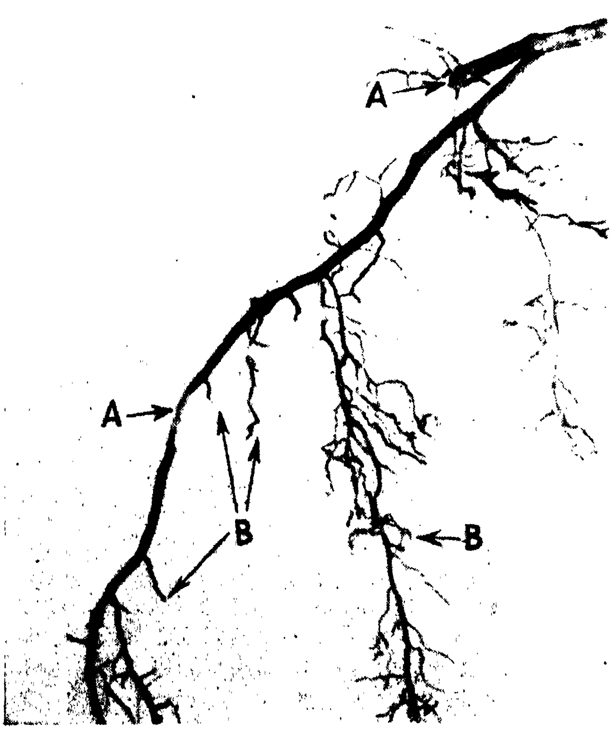


Fig. 1.—Root Rot of Rough Lemon Stock

***Phytophthora* attacks and rots the bark of the main roots (A), so that it sloughs off and disintegrates. The fibrous roots (B) are browned and rotted and break readily when the tree is lifted.**

Fig. 2.—Rotted Tap Root of a Young Tree or Rough Lemon Stock.

It is likely that *Phytophthora* is not normally present in virgin soils, but like all soil organisms it is readily introduced in soil from an infected area.

Conditions which Favour Disease Development.

Moist conditions are necessary for the growth of the fungus. The usual time for an outbreak to occur in the nursery is following continued wet weather in autumn when temperatures are moderate.

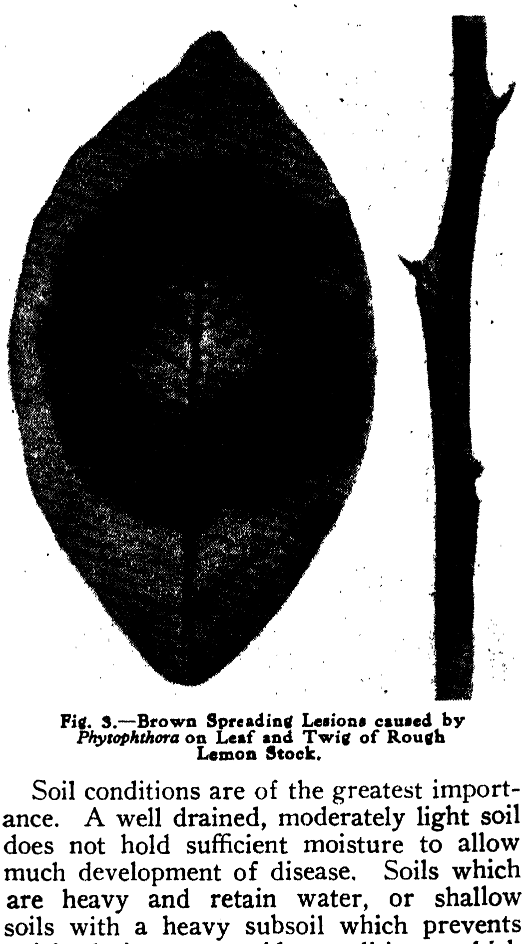


Fig. 3.—Brown Spreading Lesions caused by *Phytophthora* on Leaf and Twig of Rough Lemon Stock.

Soil conditions are of the greatest importance. A well drained, moderately light soil does not hold sufficient moisture to allow much development of disease. Soils which are heavy and retain water, or shallow soils with a heavy subsoil which prevents quick drainage, provide conditions which enable the fungus to attack the plant.

Phases of the Disease.

The root rot phase develops only in wet soils. The fibre roots are affected first, and when they rot and the tree is lifted, the fibrous roots are easily pulled away, leaving only a central thread of tissue—the woody parts of the conducting system. In severe cases the main roots and the tap root are attacked also. The infection then shows as a brown discolouration of the bark, often starting from the end of the tap root. The affected bark soon becomes soft and wet and shreds away. Where the root damage is very extensive, the leaves yellow and shrivel, while a less amount of root damage results in more or less yellowing and stunting of the leaves.

All above-ground parts can be attacked. Young shoots infected at the tip, turn brown and die back; leaves develop brown spreading spots; stems may be encircled by a dark-brown rot which often starts from a leaf base, indicating that infection entered the stem from a diseased leaf. Stem infections are usually accompanied by the production of gum. A period of damp atmospheric conditions is necessary to permit shoot and stem infection.

All citrus varieties commonly grown are susceptible to infection, but the Eureka and Lisbon lemons are the most susceptible. Rough lemon root stock shows some slight resistance, while *trifoliata* root stock is immune. Consequently the stem girdle phase of the disease is commonest on budded lemon trees and shows up first on these. As the attack occurs during damp weather, wilting of the top may not take place at once and the disease may spread considerably before it is observed.

Precautionary Measures which Nurserymen Should Take.

Of first importance is the choice of soil and site for the nursery beds. The soil should be sandy loam or loam of good depth, under-drainage must be good and provision should be made for the quick removal of surface water following rains. The beds should be exposed to full sunlight and not shaded in any way. Weed growth should be kept down in the autumn so there is a good circulation of air between the plants and quick drying after rain or dew.

As soon as infection is observed, all diseased material should be removed and burned. If infection occurs in a seed bed, adjacent seedlings should also be removed.

Seedlings grown in proximity to infected seedlings in the seed bed should not be planted out, since a certain amount of infection will certainly be present on their roots and will persist and show up as soon as wet conditions are experienced.

After removal of saleable plants, all unsold trees and unbudded stocks should be dug up and burned and the ground planted with a green crop.

Because budded lemon trees are extremely susceptible they should be sprayed in early March with Bordeaux mixture 4-4-80, plus half a gallon of white oil. The lower 18 inches of the stems especially should be thorougly drenched, and as a precaution, the soil between the rows should be sprayed also. Provided the spray is applied in early March, sufficient time will elapse between spraying and the fumigation of trees for supply to the Murrumbidgee Irrigation Area or interstate, to reduce danger of defoliation to a minimum.

Root Diseases of the Banana.*

C. J. MAGEE, D.Sc.Agr., M.Sc., Chief Biologist.

THE root system of the banana consists of a large number of long, normally-unbranched, cord-like roots which radiate from the corm and an extensive system of thread-like lateral roots arising from these cord roots. The whole of the surface of the lateral roots and part of the surface of the cord roots are densely covered with microscopic root hairs, providing a great expanse of absorbing tissue. This extensive root system is fleshy and unprotected by bark, and is prone to meet with many misadventures during growth, from injuries, pests and diseases.

Normally, much of the loss of roots which occurs is quickly replaced by both new cord roots and laterals, and the plant suffers little apparent setback. Sometimes the attack on the roots is such that the renewal of roots or the development of defensive inner cork cells fall short of requirements, and the plant becomes unthrifty and reflects this condition in its foliage.

Banana Wilt or Panama Disease.

The most closely studied of the root diseases of bananas is Banana wilt or Panama disease (see Figs. 1 and 2). Although fairly widespread in New South Wales, this disease is of little importance. This is because our industry is based on the Cavendish and related varieties (Williams Hybrid, Mons Marie) which are highly resistant to the pathogen — *Fusarium oxysporum cubense*. In tropical countries where the Gros Michel variety is grown, wilt is usually a disease of major importance and special types of soil are selected to avoid it. Panama disease is encountered in New South Wales only in such varieties as Lady's Finger, Sugar and plantains.

The fungus invades the cord roots, directly or through injuries, and enters the vascular or sap system. Eventually it becomes established in the vascular tissue of the corm, and the plant wilts if young, or

Fig. 1.—Banana Wilt or Panama Disease in a Stool of the Lady's Finger Variety.
Showing death of plants, drooping of leaf blades and scorching of their margins.

older plants show pronounced yellowing of the foliage and splitting of the base of the pseudo-stem. Infected plants eventually die.

*Notes of an address given to the Banana Inspectors' Conference, Murwillumbah, 1947.

Rhizoctonia Root Rot.

The most widespread banana root disease in this State is one caused by the soil-inhabiting fungus *Rhizoctonia solani.* The disease rarely proceeds to a stage of development sufficient to cause serious losses, but the fungus is the main cause of death of laterals, and cankers on the cord roots, so commonly observed when plants are uprooted (Fig. 3). When the cankers girdle or ringbark the roots, particularly if the cankers are near the root bases, much root tissue may be lost. Usually the growth of new roots and the branching of roots behind the point of attack offsets the damage done by Rhizoctonia.

Some severe outbreaks of the disease have occasionally been observed, however, resulting in pronounced symptoms in the above-ground parts. In these cases growth came almost to a standstill and the foliage became yellow in colour. On plants which were carrying bunches the fruit shrivelled and blackened. In the severe outbreaks considerable rotting of the cord and lateral roots was present, as well as rotting of the outer layer of the cortex of the corm. The conditions which favour Rhizoctonia root rot have not yet been closely examined, but most of the severe outbreaks have been observed during the late summer and early autumn, following periods of heavy rain.

Fig. 2.—Banana Wilt or Panama Disease.
Cross section of pseudo-stem of the Lady's Finger variety, showing dark brown discoloration of the vascular bundles and surrounding tissues.

In some instances a species of another fungus, *Pythium,* has been isolated from both the roots and from dark grey discoloured areas deep in the cortex of the corm. Attempts to establish the pathogenicity of *Pythium* sp. have not so far been successful, but the discolouration of the interior of the cortex as well as the acute nature of the outbreaks strongly

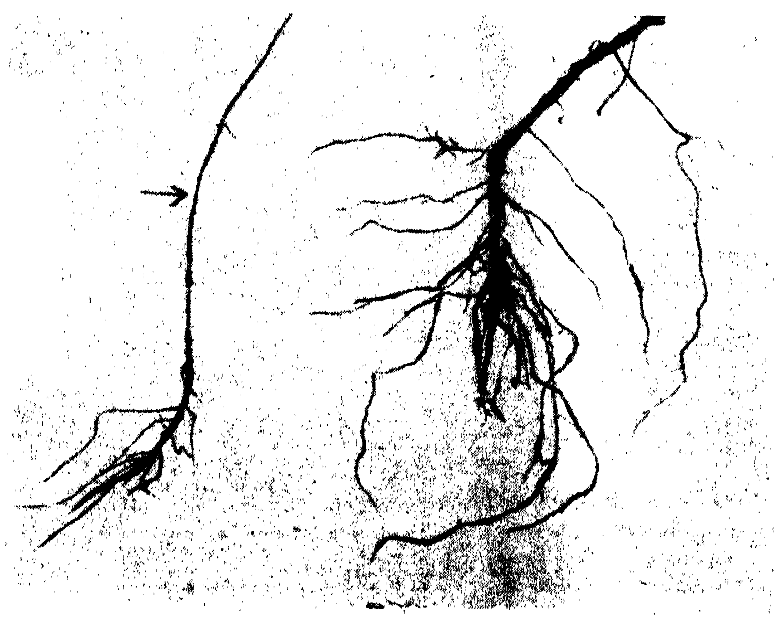


Fig. 3.—Rhizoctonia Root Rot.
Left.—Showing girdling of a lateral root at point indicated by arrow.
Right.—Showing brown and black lesions on a cord root and multiple branching of its tip after it has been injured by the fungus.

Ensilage Pit 35′ x 15′; x 7′ deep. Lined 6′ deep with 5/16″ Masonite Tempered Presdwood. Pit was filled with green maize. When opened 15 months later silage was found to be moist and in excellent condition. Examination of the Masonite lining proved that it was quite sound and had not been corroded by the very strong liquor generated in the silage.

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points to the activity of another pathogen in association with *Rhizoctonia solani*. The typical severe outbreaks of the Rhizoctonia

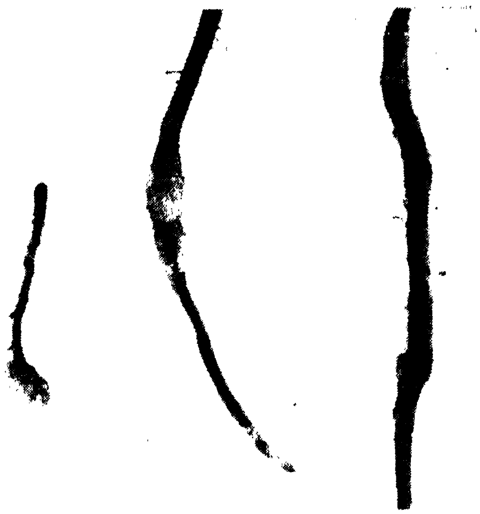


Fig. 4.—Root-knot showing Galls or Swellings on Cord Roots and Laterals caused by Eelworms.

disease have always occurred in plantations established on somewhat infertile grasslands, and the dark grey discolouration of the interior of cortex of corm has not been present.

Fig. 5.—Corm Rot, showing White Strands of the Fungus Ramifying Through the Rotted Areas of the Corm.

Rhizoctonia solani is regarded as a normal soil inhabitant of most, if not all, plantation soils. It would be expected that the fungus would be introduced on planting stock to virgin forest and scrub soils and that it would be a normal soil inhabitant of most grasslands. The amount of damage it does to bananas is considered to depend on the incidence of weather and other conditions favourable to its pathogenic activity. Low plant vitality and slow rate of growth resulting from insufficient soil nitrogen appear to be the most important factors governing destructive outbreaks of the disease on old grassland soils.

It is thought that the best means of combating Rhizoctonia disease are the frequent applications of sulphate of ammonia during the growing months of the year. Light applications (say 2 oz. to each young plant in the stool) at six-weekly intervals from August to April are suggested. Where cow manure free from couch grass is available, this also would be worthy of trial in plantations on old grassland.

Root Knot.

Root knot caused by the parasitic eelworm *Heterodera marioni* is also a common and widespread disease in New South Wales. Like the Rhizoctonia disease, it only rarely causes affected plants to be unthrifty.

The eelworms invade both the cord and lateral roots (Fig. 4), leading to the formation of galls or swellings of varying sizes. The tips of the roots are particularly prone to attack. The larger galls arise from the attack of many eelworms on a given area.

The galls result in disturbance of the sap-conducting system, and later in the rotting of tissues in the infested areas of the roots. The parasite is favoured by warm conditions of summer, and its activity is slowed or ceases in the winter.

No special measures are at present taken against this disease, but it is probable that further investigation would reveal that it is desirable to avoid introducing the eelworm to new land by some form of treatment of the planting bits or suckers, or use of planting material from areas known to be free of eelworm. Considerable experimentation would be necessary to determine an appropriate pre-planting treatment for suckers, and probably many surveys would need to be undertaken before eelworm-free sources of suckers were located.

Corm Rot.

In plantations established on virgin forest land, heavy losses from root and corm rot (Fig. 5) caused by *Clitocybe* sp. and *Armillaria mellea* sometimes result in heavy losses during the first few years. After felling and clearing, the fungi live on as saprophytes in stumps and roots left in the land, and from this source may invade young banana plants.

No marked symptoms of attack are evident in the foliage until the fungus has obtained a good hold on the corm and root system. The yellow appearance of affected plants first brings them under notice, and leaves later turn brown and die from the base of the plant upwards. One-sided attacks on plants are common, and the leaves die first on the side that is attacked. At an advanced stage of the disease the plant is easily pushed over. The pseudo-stem generally breaks off cleanly at or just above ground level, showing a brown discolouration of the corm with white fungous threads and plates interwoven with the brown tissue.

Because of corm rot it is desirable that clearing of forest land should be as thorough as possible, but there are limitations to what can be done economically in this regard. Care should be taken to remove or burn any stumps and large roots encountered while digging the holes for the sets.

Infected stools should be dug out and burned and an attempt made to locate the source of the infection. Replanting the site is usually not advisable, unless several stools are involved, and even then the work should be delayed for some months or a season.

Hybrid Maize—Plans to Speed Production.

COMMONWEALTH and State specialists engaged on hybrid maize work will in future meet periodically with a view to speeding up development of this industry.

That decision was made by the Australian Agricultural Council at its recent meeting, said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), and should give considerable impetus to production of hybrids, and also to commercialising proven hybrids.

Hybrid maize production was such a highly technical undertaking that the Council considered it merited the close collaboration of all trained personnel in the Commonwealth. Not only should such a move speed development to the commercial production stage, but it should also prove economical.

Development of hybrid maize in New South Wales had been commenced some fifteen years ago, but depletion of technical staff during the war years forced suspension of the breeding and selection programmes.

The hybrid maize programme was again well under way at Grafton and at Hawkesbury Agricultural College, said the Minister.

At Grafton and Glen Innes farms the breeding and testing of inbreds and single crosses and of commercial hybrids was being carried out. Years of breeding and testing were necessary before hybrids could be released to growers.

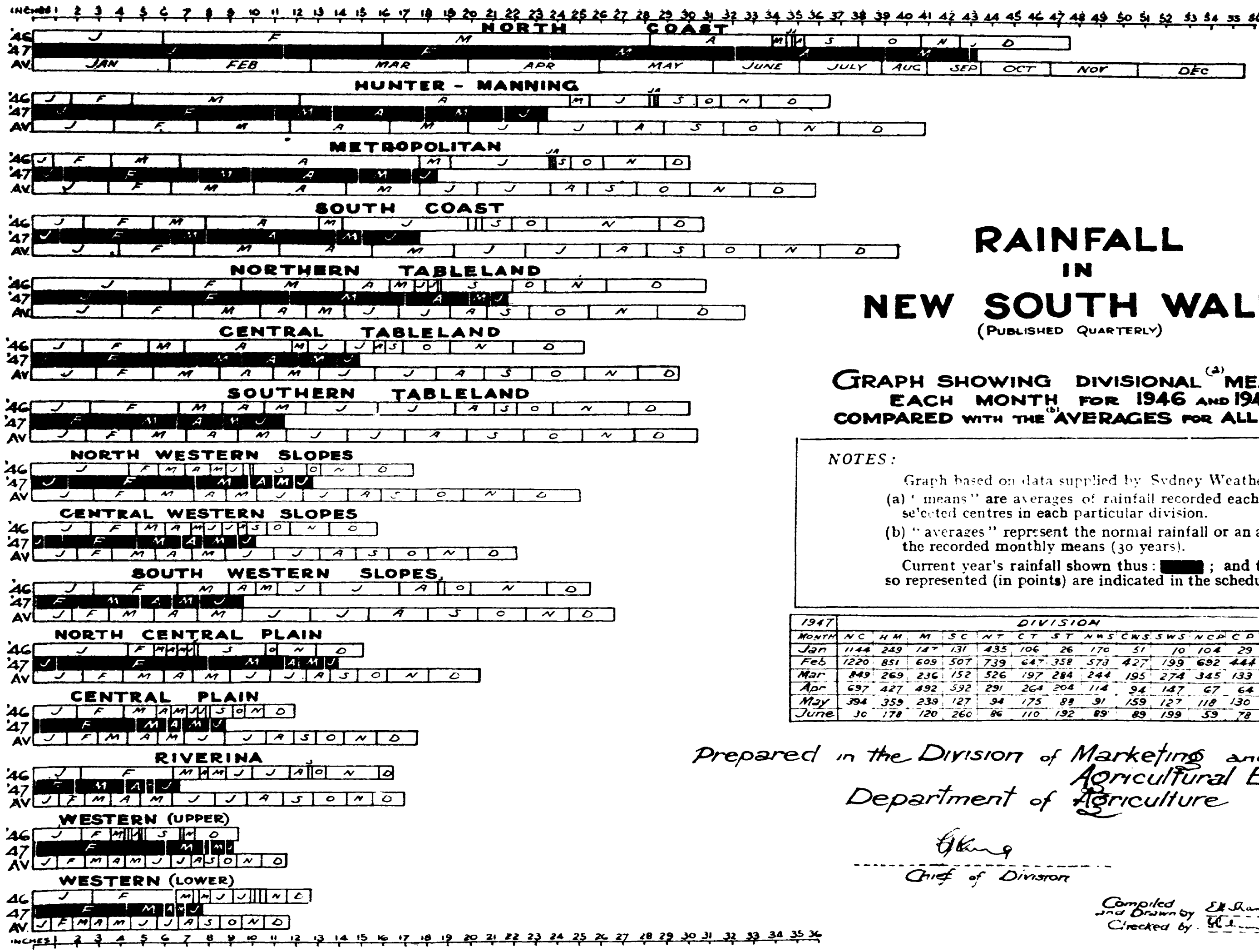
At Grafton, plant breeders had concentrated on mid-season and late maturing hybrids suitable for coastal growers. Glen Innes was concentrating on early maturers suitable for tableland conditions, and Hawkesbury College on mid-season types for the lower south coast and south-west slopes.

Hybrids which had shown promise were being tested on private farms under a wide range of conditions, said Mr. Graham. Those which stood up to test under commercial conditions would be released to growers. That would be probably in the next two or three years at Grafton. Judging by the success last year of some hybrids produced from material obtained from U.S.A., and also locally produced hybrids, early maturing types suitable for tableland conditions should be available shortly.

RAINFALL IN NEW SOUTH WALES

(PUBLISHED QUARTERLY)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1946 AND 1947 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS.



NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means (30 years).

Current year's rainfall shown thus: ▇; and the figures so represented (in points) are indicated in the schedule below:

1947	DIVISION														
MONTH	NC	HM	M	SC	NT	CT	ST	NWS	CWS	SWS	NCP	CP	R	WU	WL
Jan	1144	249	147	131	435	106	26	170	51	10	104	29	11	12	[illegible]
Feb	1220	851	609	507	739	647	358	573	427	199	692	444	174	592	423
Mar	849	269	236	152	526	197	284	244	195	274	345	133	230	174	164
Apr	697	427	492	592	291	264	204	114	94	147	67	64	96	25	65
May	394	359	239	127	94	175	88	91	159	127	118	130	36	70	33
June	30	178	120	260	86	110	192	89	89	199	59	78	118	37	83

Prepared in the Division of Marketing and Agricultural Economics. Department of Agriculture

Chief of Division

Compiled and Drawn by

Checked by

WEEDS IN SPORTS AREAS.

Their Prevention and Control.

(*Continued from page* 364.)

A. PEARSON, H.D.A., Weeds Officer.

A DESCRIPTION of the several types of weeds that infest playing fields and the means by which these areas become infested were given in the first section of this article in the July issue.

The present instalment discusses chemical control of these weeds by the use of the arsenic compounds, and sodium chlorate, common salt, sulphate of ammonia and sulphate of iron. Next month's concluding instalment will deal with control by the use of the hormone type selective weedicides.

Control by Chemical Means.

It must be realised that if weeds are removed from any area by chemical means they must be quickly replaced by some desirable form of vegetative cover or else the original or some other species of weed will quickly occupy the space. Chemicals cannot be looked upon as weed preventives but only as means of eradication and control.

Where a playing area that is in constant use is heavily infested with weeds it is not in all cases advisable to take steps to remove the whole of the weed infestation in one operation, as inevitably large bare patches must result. With heavy infestations, therefore, it is advisable to carry out the process of removal gradually so that the lawn grasses can replace the weeds over a period of time without losing the area for playing purposes during the process.

Where a reasonably heavy infestation is to be treated by some chemical, it is always advisable to mark the area out in strips. On greens this can best be done by the use of long lengths of twine, and on fairways and larger areas by placing a line of pegs.

Chemicals used for weed control work kill in three different ways:—

1. By a poisonous action on the plant, *i.e.*, destroying by actual contact with the weedicide.

2. By altering the chemical nature of the soil.

3. By upsetting the plant metabolism.

Arsenic.

These are numerous proprietary arsenical mixtures on the market which are quite effective for weed control work. The majority of these mixtures contain approximately 30 to 40 per cent. of arsenite of soda or arsenic pentoxide, with the addition of a "wetting" agent.

A Power Spraying Outfit Being Used to Control Paspalum on Footpaths.

Where it is not desired to use a proprietary arsenical weedicide, either arsenic pentoxide or arsenite of soda can be used. Arsenic pentoxide is the most suitable of these two compounds. Its advantages are:—

(*a*) It is readily soluble in water.

(*b*) At low concentrations it is selective in its action.

(*c*) Excess material quickly reverts to a non-injurious compound in the soil.

Where either arsenic pentoxide or arsenite of soda is being used it is essential that a suitable "spreader" or "wetter" should be incorporated in the mixture. There are a number of commercial wetting agents on the market, but either soft soap or phenyl will be found to be quite suitable for the purpose if incorporated in the spray mixture at the rate of 1 oz. per gallon.

As a general recommendation arsenic pentoxide used at the rate of 1 lb. to 8 gallons of water (1 in 80) will be found to be effective. This concentration will brown off couch grass, but it will quickly recover from the effects of the spray. For most purposes the concentration of arsenic will vary between 1 lb. to 4 gallons and 1 lb. to 10 gallons, but for some types of lawn weeds it will be found that even as light an application as 1 lb. to 16 gallons will be quite satisfactory.

When using arsenic it should be remembered that it is very poisonous, and operators should take care to see that the spray is not carried on to their faces or arms by the wind. It is advisable to wear rubber gloves when spraying with arsenic or else to cover the hands and arms with grease, for if arsenic solution collects around the operator's nails it may cause them to lift, and it will definitely cause a large sore to spread around any scratch it may enter. Any buckets or pumps used when applying arsenic should be washed immediately the spray work has been completed.

Before applying arsenic to any green the grass should be cut, and the spray should not be applied unless the foliage is dry. If rain occurs shortly after spraying it will be necessary for the operation to be repeated. Arsenical weedicides should be applied through a spray-pump in as fine a form as possible, in sufficient quantity to wet all of the foliage of the plants being treated.

While it is quite safe to use arsenicals at the rates recommended, it should be remembered that heavy applications of arsenic can cause soil sterilisation, so that care must be taken to see that the spray is not accidentally spilled or the result may be an area completely denuded of cover, where the soil will have to be replaced before turf will again grow satisfactorily.

Sodium Chlorate.

This is purchased as a white, crystalline salt which is readily soluble in cold water, and is best applied as a fine spray. In the form in which purchased it is quite safe to handle, but once it has been in solution with water and has then dried on any vegetable matter, clothing, leather, etc., it becomes inflammable and may ignite and burn furiously either from friction or as a result of the application of a flame. Operators should, therefore, take care to see that the spray is not blown on to their clothing, and it is advisable, if sodium chlorate is being used extensively, to wear rubber boots.

There is a commercial preparation of sodium chlorate on the market, under the name of Atlacide, from which the fire risk has been largely eliminated. This weedicide is much safer to handle, is retailed at approximately the same price and gives practically identical results with pure sodium chlorate.

For deep-rooted, persistent perennial weeds, sodium chlorate is used as strong as 1 lb. to 1 gallon of water, and for the softer weeds as light as 1 lb. to 10 gallons of water. It is essential to remember that this weedicide will affect grasses equally as much as it will damage weeds, and that with heavy applications it will cause sterilisation.

It is of considerable value for applying in heavy quantities to paths to kill any form of weed growth. When using sodium chlorate it is necessary to add a wetting agent. The most suitable is a sulphonated oil type.

Coarse Salt (*Sodium Chloride*).

This is probably one of the oldest weedicides, but it is not now in general use except for special purposes. It can be used for the destruction of weeds on paths. When applied at 5 lb. to the square yard it will

cause soil sterilisation. It has the disadvantage over other method of soil sterilisation of creating a crumbly surface to the treated soil.

Salt is sometimes used to kill single weed plants on greens. When used for this purpose 1 lb. of salt should be dissolved in 3 pints of water and 2 tablespoons applied per plant.

Sulphate of Ammonia.

Sulphate of ammonia is, of course, a nitrogenous fertiliser, and is generally used to encourage grass growth. When applied in heavy quantities, however, it will burn off weed plants. The general method of application as a weedicide is to prepare a lawn sand. This is made by mixing—

3 lb. sulphate of ammonia.

4 lb. dry soil or sharp sand.

3 lb. sulphate of iron.

This mixture is sufficient to treat 1,000 square feet of lawn area. The effect of the application of sulphate of ammonia lawn sand is sometimes severe, but this can be modified by a thorough watering immediately following the application. The lawn grass made be burned slightly but it will not be permanently damaged and will recover quickly.

Another lawn sand mixture which is sometimes used is:

3 lb. sulphate of ammonia.

1 lb. sulphate of iron.

20 lb. sand.

This is sufficient to treat 1,000 square feet of lawn area, but with this mixture it is necessary to repeat the treatment at two or three week intervals until all of the weeds have been eliminated.

Sulphate of ammonia is also used for "spotting" broad-leaved weeds. When used for this purpose it is recommended that it should be applied to the plants to be killed in the early morning when they are damp with dew.

Sulphate of Iron.

This chemical is usually only used in conjunction with sulphate of ammonia in the preparation of lawn sand. It is, however, of value to destroy moss. For this purpose it should be applied as a 5 per cent. solution in water in sufficient quantity to wet the moss thoroughly. While the application of sulphate of iron will kill any existing growth of moss, the presence of this plant is an indication that the soil conditions are unfavourable to the growth of grass, and a re-infestation will almost certainly occur unless steps are taken to improve the physical condition of the soil.

(To be concluded.)

Pitting of Root Crops.

WHEN root crops have to be harvested and are not required for immediate use, certain types may be stored during the winter and early spring months in "pits" in the same way as potatoes are stored in the field. Carrots, swedes and mangolds lend themselves to this method of storing.

They are stacked in a well-ridged heap up to 3 ft. 6 in. high, about 4 ft. wide at the base and long enough to accommodate the roots required to be stored. Two logs placed parallel to one another and 4 ft. apart serve to hold the heap in shape. The site selected for "pitting" should be level and well drained. After heaping, the roots are covered first of all with dry straw, grass or other suitable material to a depth of approximately 6 inches, and finally with 6 inches of soil. If weather permits, it is advisable to delay earthing up for a few days so as to allow excess moisture to dry out. The soil should be well beaten down with the back of a spade after earthing up. It is advisable to provide ventilation by allowing bundles of straw to project through the soil at intervals of three or four feet along the sides of the pit. A drain should be dug around the heap to carry away rain water.

Roots required to be stored should be thoroughly mature and perfectly dry, otherwise heating followed by rotting will occur. The tops should be removed, but not too closely, and portion of the neck should be attached to the root when possible. The roots should be freed from as much dirt as possible, but not trimmed or damaged in any way. In fact, the importance of careful handling cannot be overstressed.

INSECT PESTS.

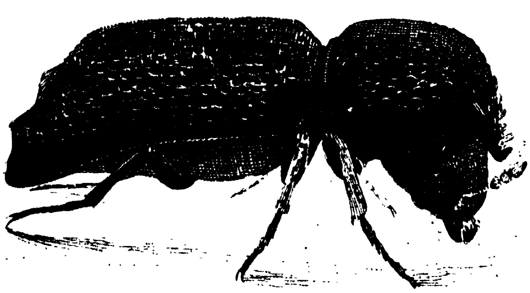
Notes contributed by the Entomological branch

An Auger Beetle (*Bostrychopsis jesuita*).

THIS beetle attacks various native trees and also many introduced ones. Amongst the trees injured are various species of Eucalypts and Acacias, silky oak (*Grevillea robusta*) white cedar (*Melia azedarach*) and pepper trees (*Schinus molle*). Apple, apricot, fig, lemon and orange trees also are damaged.

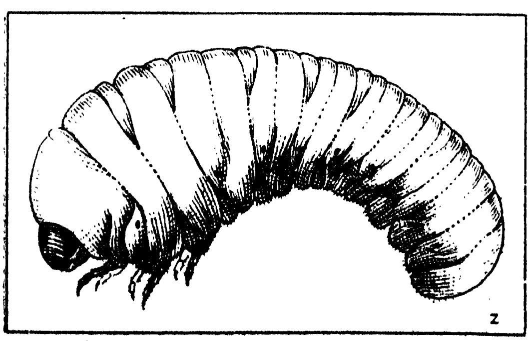
Although it is usually considered that this beetle attacks unhealthy, dead or dying trees, it has been recorded attacking and killing apparently healthy trees.

The adult, which is the largest known species of auger beetle in Australia, is of variable size, measuring from about ½ to ¾ inch in length. It is of a general glossy black, with reddish-brown antennae, the terminal segments of which form three-segmented clubs. The head is turned down



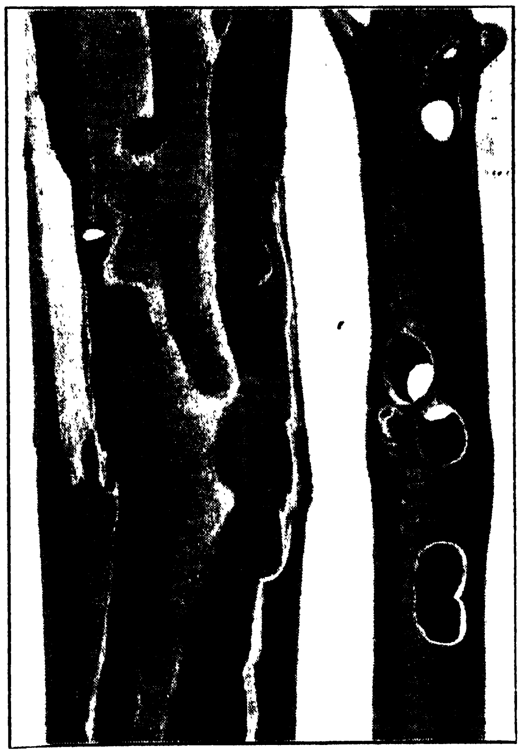
The Large Auger Beetle.

beneath the thorax, the front portion of which is covered with small spines, and



Larva of the Large Auger Beetle.

bears two longer processes which overhang the head in front of the eyes. The wing-covers bear rows of deep pits, and the



Damage Caused by the Larvae and Exit Holes of Adults of the Large Auger Beetle.
(Actual size.)

undersurface of the body is covered with minute whitish pubescence. The whole insect is more or less cylindrical.

This beetle has been observed to lay its eggs just below the surface of the bark. Allied species abroad lay their eggs in natural cracks and holes in the wood or in short tunnels made by the female.

The larva is a thick-set grub, with three pairs of legs, and a small brown head. The tunnels in which it has been feeding become tightly packed with frass and undigested residues of wood eaten by it. The larva, when fully-fed, enters its pupal stage within a cell at the end of a tunnel, and the adult, when ready to emerge, bores an exit hole through the surface of the bark.

These beetles derive their popular name from their habit of boring circular auger-like holes. French* records an instance where an adult of *B. jesuita* was placed under a tumbler for observation, and in one night bored through a stout cedar table, through a carpet and partly through a strong floor, where it was discovered, still boring, the following morning. The adults have also been recorded boring through lead-covered aerial cables.

*French (Senr.), C. 1909—Destructive Insects of Victoria, Part IV, p. 89.

About forty native species of auger beetles (*Bostrychidae*), are found in Australia. The cosmopolitan, introduced beetle, *Rhizopertha dominica,* which is known popularly as the "lesser grain borer," is also an auger beetle. This insect, which measures about ⅛ inch in length, tunnels within wheat grains and destroys them.

No means of controlling borers of this type in trees are at present known, but where feasible, heavily-infested limbs may be cut off and burned and any cut surfaces painted with bluestone paint.

The Yellow Maize Moth (*Dichocrocis punctiferalis*).

DURING the past month the caterpillars of this moth have been recorded causing damage on the North Coast of this State. They have been found feeding in custard apples and oranges at Grafton, and in pawpaw fruits and flowers at Murwillumbah.

This insect is known to have a wide range of food plants of economic importance, and was recorded in the *Agricultural Gazette,* as far back as fifty years ago, as a pest of peaches. It is widely distributed and is found in China and Japan, India, Ceylon, Burma, the Malayan subregion and the Australian region.

Where fruits are attacked the caterpillars tunnel towards the centre and eat away the flesh from around the seeds. Gnawed holes appear in the fruits, and these become covered with quantities of frass loosely held together with silken strands.

Where plants such as maize and sorghum are attacked, the caterpillars form their web masses amongst the tassels and grains of maize, and the seed heads of sorghum.

The adult, which has a wing expanse of about 1 inch, has bright yellow wings marked with scattered black spots and several oblique lines of black spots across them. The body which is also yellow has lines of black spots.

The larvae or caterpillars, which may measure about ¾ inch in length when fully-fed, are of a general light greyish colour, but at times are tinged with pink or green. The head is dark and there is a dark "shield" on the upper surface of the first body segment. The body is covered with small dark areas from which arise fine hairs.

The pupa or chrysalis, which measures about ⅝ inch in length, is brown.

The Army Worm (*Cirphis unipuncta*).

DURING the past month great numbers of yellowish-grey moths have been noted in various suburbs around Sydney, where they have been seen flying about gardens and around street lamps, or have been disturbed in their hiding places. They have been attracted to lights in dwellings and shops, and in some instances have come to rest amongst clothing, etc.

Some alarm has been caused amongst householders and others, but beyond the annoyance they may cause by their presence, or the "dusting" of materials with the scales rubbed from their wings or bodies, nothing else need be feared, so far as their presence in buildings is concerned.

It is not usual for these moths to make their appearance in numbers so early in the season, during very cold weather.

Later the moths will begin egg-laying, and it is possible that their larvae or caterpillars may also occur earlier than usual this year, and in considerable numbers. Growers, therefore, should watch for any indications of damage to their crops and undertake control measures, or take precautionary measures before planting out.

The larvae of these moths, which are known popularly as "army worms," feed upon a wide variety of grasses and weeds, vegetable crops or garden plants, and may cause extensive damage to young plants soon after they appear above ground, or to newly planted out crops, by eating through the stems at ground level.

These caterpillars, which are the larvae of a "cutworm" moth, are referred to as "army worms," because at times they move in vast hordes over cultivation paddocks, stripping most plants bare of foliage.

Most species of cutworm caterpillars feed at night, and shelter during the day, either in the soil or under clods, but the army worm may feed during the day.

The life history of this insect, briefly, is as follows:—

The eggs, which are creamy or whitish, are laid by the moth in clusters, or in rows, usually near the base of the plant, and are firmly glued on. Several hundred eggs may be laid by an individual female.

The larva, which may measure up to 1½ inches in length when fully-fed, is of variable colouration, but usually dark greenish-grey, with longitudinal stripes on the sides and back. There is usually a distinct lighter stripe along the sides, and above this stripe there is a line which may be almost black. The larval stage occupies from about three to four weeks. When fully-fed, the larva enters the ground where it forms a small earthen cell or cavity in the soil, and within this it enters its pupal or chrysalis stage.

The pupa, which measures about ¾ inch in length, is shining reddish-brown in colour. After a period in this resting stage, the length of which depends upon seasonal conditions, the adult (moth) emerges to carry on the life-cycle.

The complete life-cycle from egg to adult, under warm conditions, varies from about six to eight weeks.

The adult, which has a wing expanse of about 1½ inches, has fawn, yellowish-grey or greyish-brown forewings, and there is a small dark area near the middle of each, and in this there is a whitish spot. The hindwings are fawn or light greyish, but are darker towards their outer margins.

This moth is an introduced cosmopolitan species.

Control.

The following poison bait is very effective in controlling cutworms:—

Bran	24 lb.
Paris green	1 lb.
Salt	8 oz.
Water	2½ gallons.

To prepare the bait, the bran and Paris green should first be thoroughly mixed, and then made into a crumbly mash with the water, in which the salt has been dissolved.

As a precautionary measure against damage by the army worm or other cutworm caterpillars, any area where cutworms are known to be already present in the soil, should be baited by broadcasting the bait over the ground, before planting out. Ground that has been cleared for planting should be treated in the same way several days after clearing.

Where crops are infested the bait may be distributed lightly along the rows or broadcast throughout the area. The baits are best used late in the afternoon.

Where cutworms remain on the plants, and the baits are out of their reach, a spray or dust of arsenate of lead must be used. The spray is used at the rate of:—1 lb. arsenate of lead powder to 40 gallons of water (2 oz. to 5 gal.), and the dust consists of a mixture of 1 lb. arsenate of lead powder and 4 lb. kaolin.

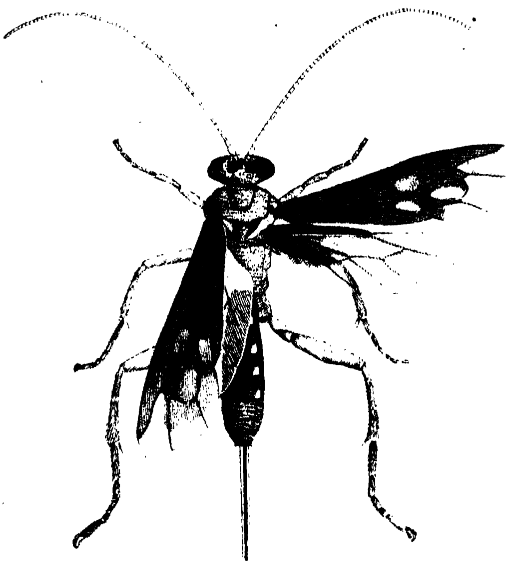
Sprays or dusts of lead arsenate should not be applied to crops such as lettuce, spinach, etc., unless the plants are only in their early stages of growth.

Wasp Parasites (*Hymenoptera*) Beneficial Insects.

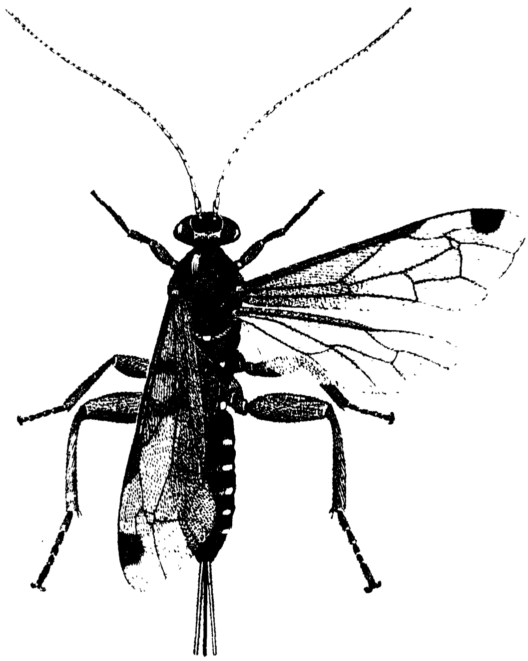
MANY species of wasp parasites play a very important part in reducing pest species of insects to minimum numbers. Most of these beneficial wasps are members of the various families which are included in the two great groups, known as the *Chalcidoidea* and the *Ichneumonoidea*.

They are mostly active fliers and some species are frequently found in flowers from which they obtain nectar.

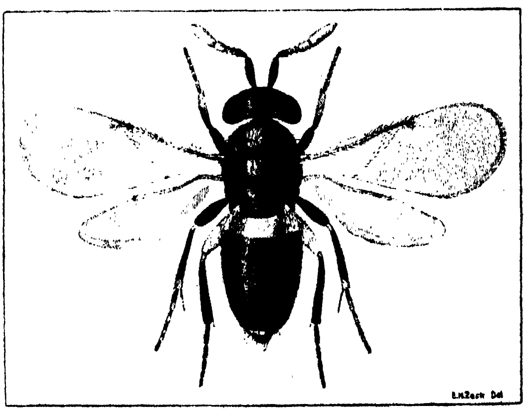
Their eggs are laid either in or upon some stage of another insect, and the



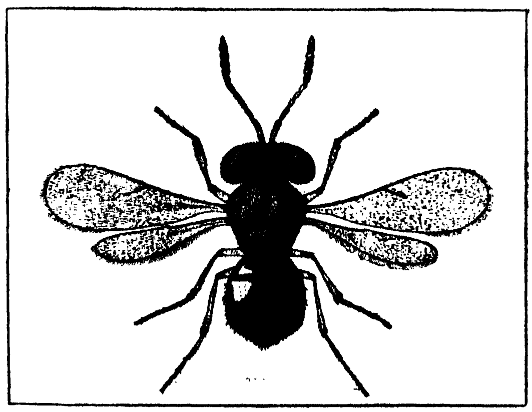
The Red and Black Ichneumon.
A parasite of cutworms and other caterpillars



The Black-bodied Ichneumon which Parasitizes various Caterpillars.



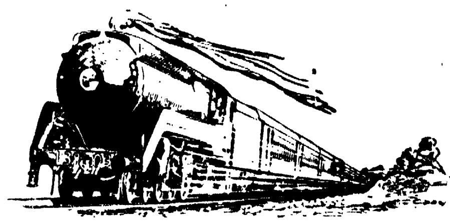
The Chalcid Wasp Parasite of the Woolly Aphid.



The Chalcid Wasp Parasite that Develops in the Eggs of the Green Vegetable Bug.

They range in size from minute forms that are so small as scarcely to be visible to the unaided eye, to large insects which may measure up to an inch in length.

parasitic larvae, which later hatch, feed upon and destroy their host. Many of the smaller species spend their entire larval life within the eggs of other insects.



The females of many species are provided with long, fine, sharp-pointed ovipositors with which they puncture the bodies of caterpillars and insert their eggs within. The legless wasp larva, which subsequently hatches, feeds on the internal organs and blood of the caterpillar, so that eventually it dies.

Two of the larger ichneumon wasps frequently observed are the brightly marked red and black species with dark wings, *Lissopimpla semipunctata*, and another which has a black body with red legs and antennae, and clear wings. Both these species measure about 1 inch in length, and the females have long, well-developed ovipositors projecting from the ends of their abdomens. They parasitize various kinds of caterpillars and become very numerous following on plagues of cutworms.

In some seasons the activities of these wasp parasites are so effective that the insects they attack are frequently prevented from reaching pest proportions.

Two small chalcid wasps that have been introduced, and have proved to be very efficient, are *Aphelinus mali*, the larvae of which develop within the bodies of woolly aphids, and *Microphanurus basalis*, which develops within the eggs of the green vegetable bug, *Nezara viridula*.

"Stock Poisoning," by T. K. Ryan—*A REVIEW*.

It is pleasing to find a field officer such as a Stock Inspector recording his experiences on the investigation of stock diseases. Too often the wealth of knowledge accumulated in a life's experience is lost by the failure to place on record the information so gained. It is common knowledge that many stock are lost from mineral and plant poisoning, and Mr. Ryan draws attention to the carelessness with which poisons are handled on farms, and the farmers' lack of knowledge of the common poisonous plants. The great use of arsenic for many purposes by stockowners has made it inevitable that this dangerous chemical would be treated with too little respect.

The author insists rightly that when post-mortem examination has shown findings consistent with the action of irritant poisons, a thorough search for the suspected poison must be made. On the other hand, he points out that some farmers are prone to jump to the conclusion that any mortality that occurs is due to poisoning, and he gives examples of such cases in which the deaths were due to contagious disease.

Although the book is entitled "Stock Poisoning" a considerable portion is devoted to diseases commonly encountered on farms and to the recognised methods of dealing with them.

The book is recommended to graziers, not only because of the information contained in it, but also because it illustrates the difficulties that may be encountered by a veterinarian or a Stock Inspector in investigating mortalities in stock. Whilst the publishers are to be congratulated on the set-up and arrangement of the book it is a pity that the botanical names of a number of the plants mentioned are wrongly spelt. [*Review by W. L. Hindmarsh, A/Chief, Division of Animal Industry.*]

Protect Young Cattle from Internal Parasites.

WORM infestation is frequently a cause of serious trouble in young stock in the coastal districts of New South Wales. Particularly in wet seasons, young animals poorly nourished, kept on the same overstocked ground, or kept in swampy areas may show serious symptoms of infestation. As calves and yearlings are most susceptible, they should be given particular consideration, and the following principles should be observed as far as possible:—

1. Keep stock off damp pastures. If impossible to drain, then reserve for adult cattle only.

2. Avoid overstocking.

3. Avoid permanent pastures for young stock, and if possible place them on pastures that have been spelled from cattle or sheep, and which have only carried horses or have been spelled from all stock. If impossible to spell, burning-off may help to minimise worm forms. Generally speaking, this is an undesirable proceeding, from the pasture management point of view, but it may be desirable under some circumstances.

4. Above all, maintain the nutrition of the calves. On weaning, supply them with a good supplementary ration and place them out on improved pastures. Upland or hill country, often used to depasture calves (to keep them fine), results in very poor development and greatly increased susceptibility to worm infestation. A suitable lick, *e.g.*, salt and bone meal placed out separately, should also be supplied.

5. Supply water in troughs. Stagnant pools with the green pick around them are a common source of heavy infestations.

SUCCESSFUL SCHOOL FOR PIG-RAISERS

At Hawkesbury Agricultural College.

STUDENTS ATTEND FROM ALL PARTS OF THE STATE.

THE Second Annual School of Instruction for Pig Raisers held at Hawkesbury Agricultural College, Richmond, from 8th to 11th July, 1947, was attended by fifty-two students drawn from all parts of New South Wales. As was the case last year, the response from intending students far exceeded the number which could be accommodated.

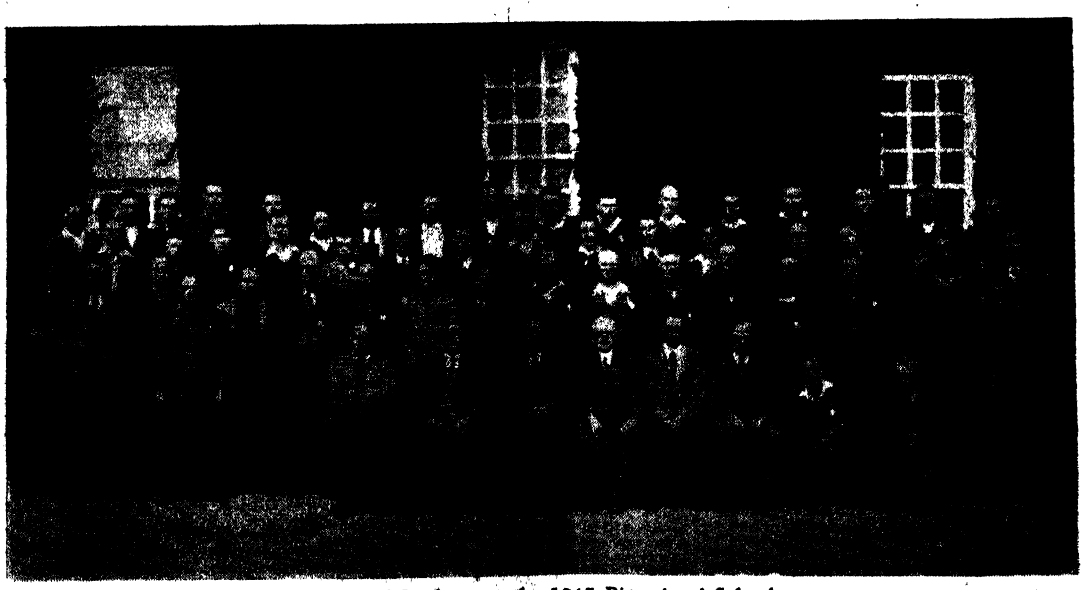
The School was officially opened by the Minister of Agriculture, the Hon. E. H. Graham, M.L.A., who commended students on their enthusiasm and interest. He also emphasised the important part such schools were playing in the campaign being conducted by the Department, aiming at increased efficiency in the pig-raising industry.

Every aspect of modern pig-raising was covered in the school syllabus, and in particular, attention was directed to judging technique based on the points of carcase quality. Various methods of carcase appraisal used in Great Britain, Canada and New Zealand were studied in detail. A comparison was made of the standards set down for the pig-raisers of those countries in supplying the requirements of the British market.

Keen interest was sustained throughout by a varied programme of yard lectures and demonstrations, epidiascope and lantern lectures and the showing of "talkie" films.

In a final test-judging competition amongst students a good standard was revealed. It was apparent that, in the limited time available, the students had successfully absorbed the information imparted.

Another satisfactory feature of the school was the high standard of the discussions which followed each lecture and demonstration.



Group of Students at the 1947 Pig-raisers' School.

Seated in front are the College Principal Mr. E. A. Southee, Minister for Agriculture, Hon. E. H. Graham, M.L.A., Chief Piggery Instructor, Mr. A. F. Gray and other Instructors.

Mr. Simpson, Piggery Instructor, conducts a Parade of Large White Pigs at the School.

Refresher Course for Ex-Servicemen Commenced at Wagga Experiment Farm.

THE first of the series of short refresher courses for ex-servicemen in the Principles of Farm Management was officially opened at Wagga Experiment Farm on Friday, 18th July, by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.).

In outlining the various activities of his Department for the assistance of the returned soldier who wished to go on the land, the Minister made reference to the co-operation with the Department of Lands in determining the suitability of estates acquired for War Service Land Settlement and the work of his Department in placing young trainees with approved farmers. Mr. Graham said he was pleased to state that 69 returned servicemen were in residence at Hawkesbury Agricultural College at the present time and that last year a returned man had become Dux of that College.

The Minister reminded students that the help and advice from his Department did not end with this Course, but that the officers of the Department of Agriculture were available and ready to assist the ex-serviceman when he took possession of his property.

The next of these Courses will start on 22nd September and applications from ex-servicemen should be made to the Deputy Co-ordinator. It was hoped to conduct these Courses at Yanco in 1948.

Tetanus in Calves.

Following Inoculation Against Blackleg.

THE importance of strictly hygienic methods and conditions in relation to inoculation is emphasised by the Chief of the Division of Animal Industry:

"Recently, an Inspector of Stock reported the occurrence of tetanus in a number of calves following inoculation against blackleg. The inspector investigated the mortality and inspected the calves. The conclusion drawn from the examination of the circumstances was that the animals became infected following the inoculation.

"From the circumstances surrounding the case, it is clear that much more care should have been taken regarding sterilisation of the instruments used in inoculating and the general cleanliness of the environment of the calves. Such an accident is always liable to occur where dirty instruments are used—and by dirty is meant unsterilised—and where such operations as inoculation are carried out in an environment which is heavily infected."

Examining the Work of a Young Queen Bee.

THE QUEEN BEE.

Her Importance and the Factors Influencing Her Value.

D. L. MORISON, B.V.Sc., Apiary Branch.

THE queen is the only full-developed female in a colony of bees, and under normal circumstances there is only one queen present in a colony.

The queen lays all the eggs from which the other bees in the hive develop. While this is an advantage in some ways, it may prove rather disastrous should a good queen be killed or lost.

It will be realised that the queen is the most important bee in the hive, and care should be taken to see that she is of as high a standard as is possible, since the quality of the queen will greatly affect the subsequent number of and quality of the workers—and therefore, the honey crop.

Those who are familiar with bees can easily recognise the queen—by her distinctive appearance—when desiring to observe or capture her, though a queen of a dark variety of bees may be very difficult to locate at times.

Development of the Queen.

Bee larvae are fed according to the type of cell in which they are located. Both queens and workers are developed from the same type of egg, *i.e.* a fertilized egg. This fact can be made use of by queen-bee breeders when inducing bees to rear large

Queen Bee and Worker Attendants.
[*After Winter.*

numbers of queens—by transferring young larvae from worker cells to wax cups shaped after the manner of queen cells.

Those larvae located in worker cells are fed so that they become workers. Larvae located in queen cells are rather more lavishly fed and develop so that they become queens. The difference between worker and queen is entirely of nutritional origin, having no genetic basis whatsoever.

Drone eggs will only develop into drones, whether located in drone, worker or queen cells.

It is not proposed to discuss methods of rearing queens in this article, other than to point out that the present market demand for queens will probably stimulate the employment of improved methods of production in the near future.

Assessing the Value of Queen Bees.

The usual show schedules for the judging of queens give scales of points for the assessment of the queen on a basis of her physical characteristics and those of her offspring. While this has the advantage that the points examined are tangible, and therefore readily assessed, it is doubtful if any of the physical characters, other than perhaps the size of the queen, have any relation to the number of and performance in honey-gathering, etc., of the queen's offspring.

The egg-laying pattern of a queen is important. However, this is usually associated with the age and individuality of the queen and seasonal conditions, rather than the particular variety or strain.

Selection of Commercial Queen Bees.

It is emphasised that the value of a desirable queen cannot be assessed by a simple examination, since other factors than appearance influence her quality. Among these are age, conditions of rearing and disease susceptibility.

Age.—This is a very important factor to be considered in queens, in hives kept for commercial production of honey, since the egg-laying capacity and vigour of a queen decline with increasing age.

Most queens are useful in their first and second years, and a few may be worth keeping into the third. However, much will depend upon the original quality of the queens and their subsequent treatment. Many large beekeepers requeen all colonies annually to make certain that no old queens remain in their hives. However, this method has the disadvantages that some valuable queens are destroyed, while some of the young queens are usually defective and must be culled as soon as faults are detected.

Conditions under which Queens are Reared.—The type and amount of food which the young queen larvae are fed are important. Queens should be reared in colonies which are capable of feeding the young larvae an abundance of chyle food. If the bees, in season, have available an abundance of a number of varieties of pollen, together with a fair nectar supply, good queens are usually reared. Defective queens (and workers, too, for that matter) are often reared on straight-lines of pollen from some sources.

A queen which has been reared under poor conditions is permanently limited in her capacity, even though adequately fed during her subsequent egg-laying career.

Freedom from "Paralysis."—The exact cause of "paralysis" still seems to be in doubt. It has been stated that, at least, one type of "paralysis" is due to a virus, and yet if this is so, there is a definite hereditary susceptibility to the disease—for "paralysis" seems to run in the strain of bee and is transmitted in some way to the offspring.

No queen whose offspring have shown any trace of "paralysis" should be used for breeding purposes under any circumstances, irrespective of the value placed on her by the apiarist because of other desirable characteristics.

To Ensure Efficient Queens.

The following procedure should be adopted to ensure that the queens in an apiary are capable of laying so as to maintain a worker force which will gather a maximum of honey:—

1.—Make certain that queens are reared under the best conditions in so far as food requirements are concerned, so that they will have the necessary physique.

2.—Make careful observation of the work being carried out by individual queens, and cull them as soon as there are indications that they are failing, replacing them with young queens. It will be found that some queens should be culled at a very early age because of some individual defect. Drone-layers need to be culled as early as they can be detected, after emergence.

Emergence of a Queen Bee from the Cell.
[*After Winter.*

Colonies can only be kept up to uniform standard if the individual queens are kept under frequent observation. Unfortunately many beekeepers have so many hives of bees that they cannot possibly look after them all properly, and many failing queens are allowed to remain.

It costs a beekeeper just as much to move unproductive colonies from one location to another as it does to move the best colonies, and much needless cost is thereby incurred. It is only by the thorough and continuous culling of queens that this expensive "tail" of the apiary can be eliminated.

The Use of Pure Strains of Bees.

In stressing the importance of the age, conditions of rearing, etc., on the value of individual queens, it is not intended to deprecate entirely any attempts at keeping and selecting certain strains of bees for desirable qualities, for unless one keeps a pure strain of bees it is impossible to predict the characteristics of the progeny.

If a beekeeper has a pure strain of bees which has given him satisfaction in the past he would do well to examine carefully the merits of any new types offering before introducing them to his main apiary. Moreover it is certain that improvement in management methods and culling of individual commercial queens are more likely to result in increased production, than is the introduction of queens from breeding stock of actual or reputed outstanding performance.

However, when an apiarist has not a pure strain of bees, the purchase of pure bred queens of proved capacity is necessary to improve the strain.

There is a tendency on the part of some beekeepers to introduce any new strains of bees which may come to their notice. Under these circumstances it is impossible to prevent cross-breeding between the different strains, and the net result is a mixture of everything and anything. A few breeders of bees attempt to exploit the more gullible members of the beekeeping fraternity by publicising and disseminating any strain of bees which has "caught-on" for the time being.

Much has been said of the importance of "new-blood." However, its importance appears in some instances to be negligible in bee-breeding work.

It is thought that the improvement in the performance of present stocks of bees as

The Queen Immediately After Emergence.
[*After Winter.*

the result of constructive breeding is not as great as is popularly supposed. Not enough is at present known of the genetics of the

(*Continued on page* 444.)


There's POWER
AT THE DRAWBAR OF THE
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Fordson MAJOR
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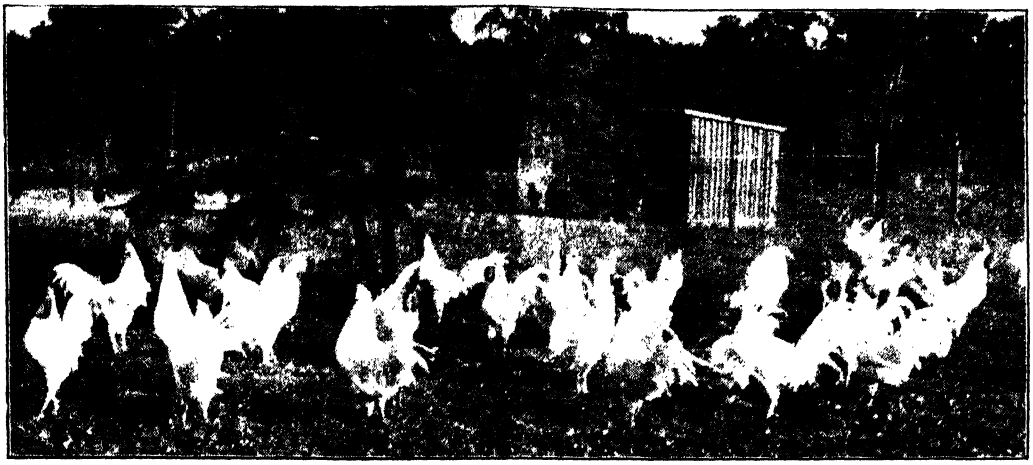


POULTRY NOTES.

RATIONS FOR POULTRY.

E. HADLINGTON, Principal Livestock Officer (Poultry) and G. L. McCLYMONT, B.V.Sc., Veterinary Research Officer.

FEED is usually responsible for about half the total cost of egg production. Efficient rations are, therefore, one of the most important single factors in successful poultry farming.

These notes contain a brief outline of the food requirements of poultry, and a number of sample rations which can be used with confidence by poultry farmers.

What Feed do Fowls Need?

Poultry require a great number of essential nutrients, but only a few need be considered by the practical poultry farmer. These are:-

Energy and Fat Building Materials.—These are obtainable from the starch, or carbohydrates, and the small amount of fat in grains such as wheat, maize, barley, grain sorghum and oats, and from pollard. High fibre feeds (such as bran and lucerne meal) and green feed are poor sources of energy.

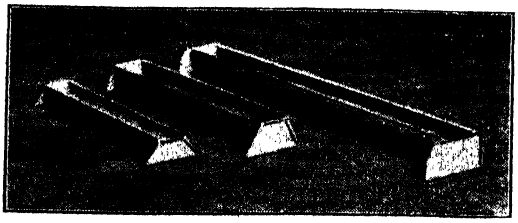


Fig. 1.—Wet Mash Feed Troughs for Chickens.

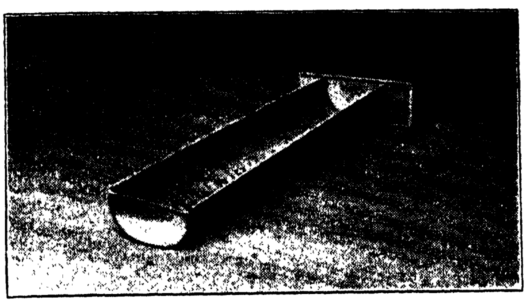


Fig. 2.—Feeding Trough Suitable for Adult or Growing Stock.

Protein.—This nutrient is essential for fast growth and maximum egg production. Rich sources are meatmeal, linseed meal and peanut meal. Coconut meal and mill offals such as bran and pollard are fair sources, and grains provide only moderate amounts. Animal proteins are preferable to vegetable proteins, but a combination of the two is satisfactory.

Calcium.—This mineral is essential for normal growth and egg production and for sound egg shells. Rich sources are shell grit, ground limestone and, to a lesser extent, bone meal. Meatmeal contains a fair amount.

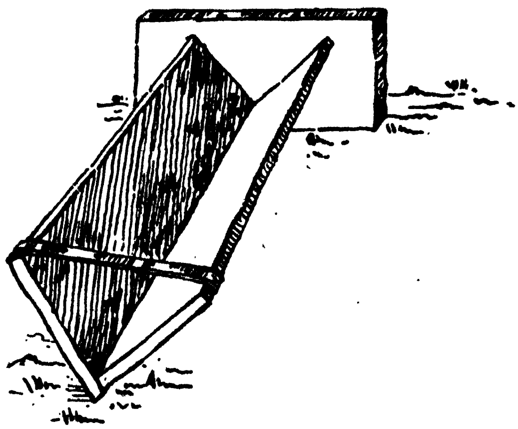


Fig. 3.—Alternative Type of Feeding Trough.

Salt, which is essential for normal health and maximum growth of young stock. Only fine common salt should be used.

Vitamin A, which is essential for normal health and egg production and prevents nutritional roup. It is obtainable from green feed or fish oils.

Vitamin D, which is essential for normal bone growth and egg production. Lack of vitamin D is a cause of rickets. This vitamin is obtainable from sunlight or, in the absence of sunlight, from vitamin D-rich fish oils.

Riboflavin.—This is essential for normal growth of chickens and normal hatching of eggs. Rich sources are green feed, lucerne meal, milk powders, skim milk, whey and livermeal.

Manganese, which is essential for normal hatchability. Bran and pollard are rich sources.

How Can Rations Supply These Requirements?

The essential constituents of all rations are combinations of energy-rich feeds such as grain; protein-rich feeds such as meatmeal, peanut meal, linseed meal and mill offals; vitamin A-rich feeds such as green feed or fish oil; calcium-rich feeds such as shellgrit or ground limestone; salt; and, for chickens and breeding stock—riboflavin-rich feeds such as milk powders and green feed.

There is no "best feed" and there is no "best ration." The best ration a poultry farmer can use is the cheapest complete ration made up with the available feeds. Poultry and, indeed all animals, have a remarkable ability for obtaining their food requirements from a variety of different feeds.

How Should the Ration Be Fed?

Provided the food contains all the required nutrients and the birds obtain as much food as they want, the actual system of feeding is of minor importance. The birds may be fed by:—

(1) *The wet mash and grain system,* which entails feeding a mash mixed with water or skim milk in the morning, and grain in the afternoon for adult birds; or several feeds of mash per day for chickens, as well as one feed of grain.

(2) *The dry mash and grain system,* which consists of providing a self-feeding hopper containing a dry mash; and another hopper containing whole grain, which is opened in the afternoon, or alternatively feeding the grain by hand.

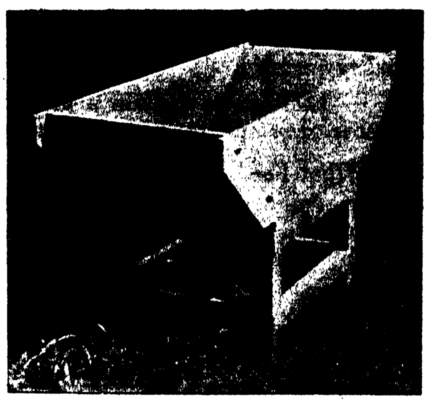


Fig. 4.—A Useful Wet-Mash Mixing Trough.

(3) *The all-mash system* which consists of providing a dry mash in a self-feeding hopper which is open to the birds at all times. No whole grain is supplied.

(4) *The free choice system,* which consists of providing a hopper of whole grain or mixed whole grains, and another hopper of meatmeal or mixed protein concentrates such as meatmeal, linseed meal, peanut meal, etc.

With all these systems, green feed should be fed once daily or vitamin A-rich fish oils included in the mash.

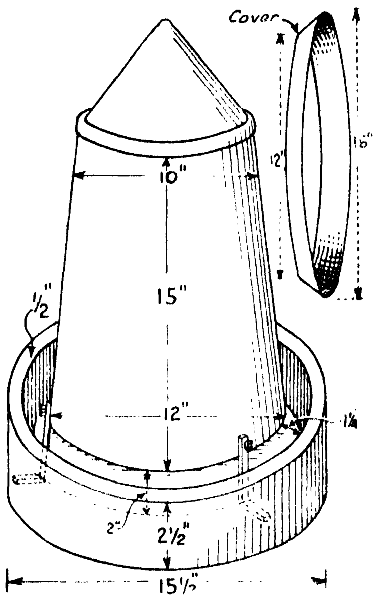


Fig. 5.—Diagram of Chicken Hopper.

The Feeding Systems Compared.

For Chickens.—A dry all-mash ration fed in self-feeding hoppers is the most convenient and labour-saving method of feeding chickens. A suitable type of hopper is shown in the accompanying illustration.

Wet mash feeding of chickens is necessary where liquid skim milk is used instead of dried milk powders. The wet mash should be mixed twice daily and fed four times daily during the first six weeks.

For Growing and Laying Stock.—A dry mash and grain, or wet mash and grain ration is usually more satisfactory for feeding these classes of stock. Recent experiments have indicated that egg production is not as good with all-mash rations as with mash and grain, fed either wet or dry. All-mash rations necessitate crushing of all the grain fed, and are accordingly somewhat more expensive. However, they are quite suitable for small backyard lots of birds, where the extra expense is of little importance, as only one feed mixture is involved.

With the dry mash and grain feeding from hoppers, regular daily mixing and distributing of feed is avoided, the feed being mixed and distributed only once or twice a week, depending on the size of the hoppers. However, regular and frequent inspection of the hoppers is necessary, as even in the best types of hoppers, the feed may "pack" and deprive the birds of food until the mash is shaken down.

Other items of importance are the initial cost of the hoppers, and the fact that with unsuitable types there may be a considerable wastage of feed. Unless the hoppers are closed at night they may encourage rats and mice. Also the water supply tends to become fouled with mash, which necessitates frequent cleaning of vessels and changing the water. The drinking nipple system (see illustration) successfully overcomes this difficulty. These nipples, fitted with a valve, are screwed at suitable intervals into a pipe run at a convenient height along the outside of the front of the house. The birds soon learn to release the valve, allowing the water to trickle into their mouths.

The pipe is supplied by gravity flow from a tank fitted with a ball cock and mounted so that the pressure at the nipple is low. That is, the lowest nipple should not be more than 2 feet 6 inches below the water level of the tank. The pipe must be protected from the sun's rays, and under heat wave conditions, a supplementary water supply must be provided, since the water in the pipes becomes heated.

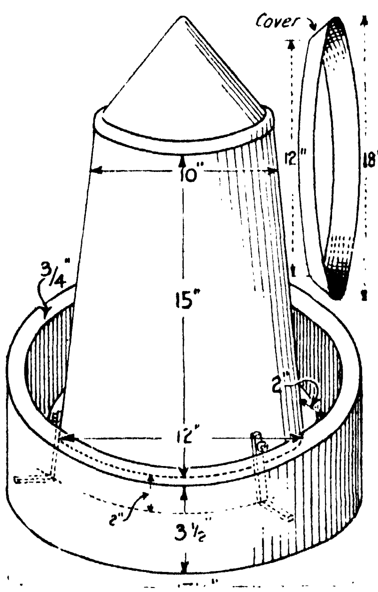


Fig. 6.—Diagram of Hopper for Adult Birds.

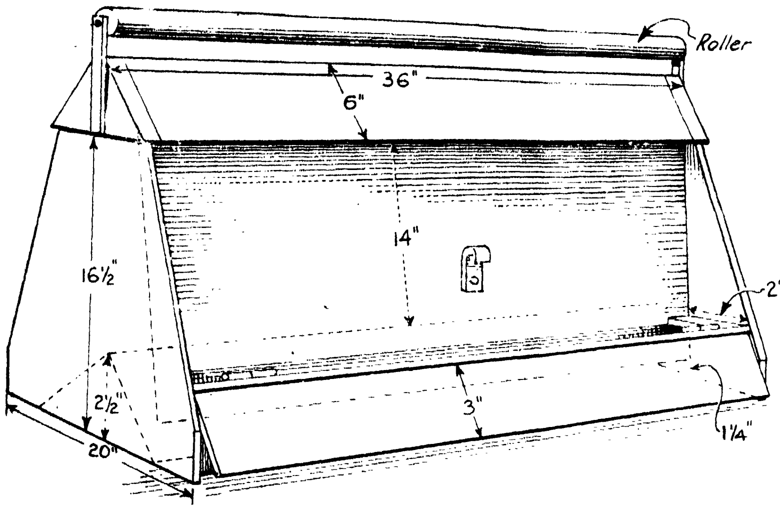


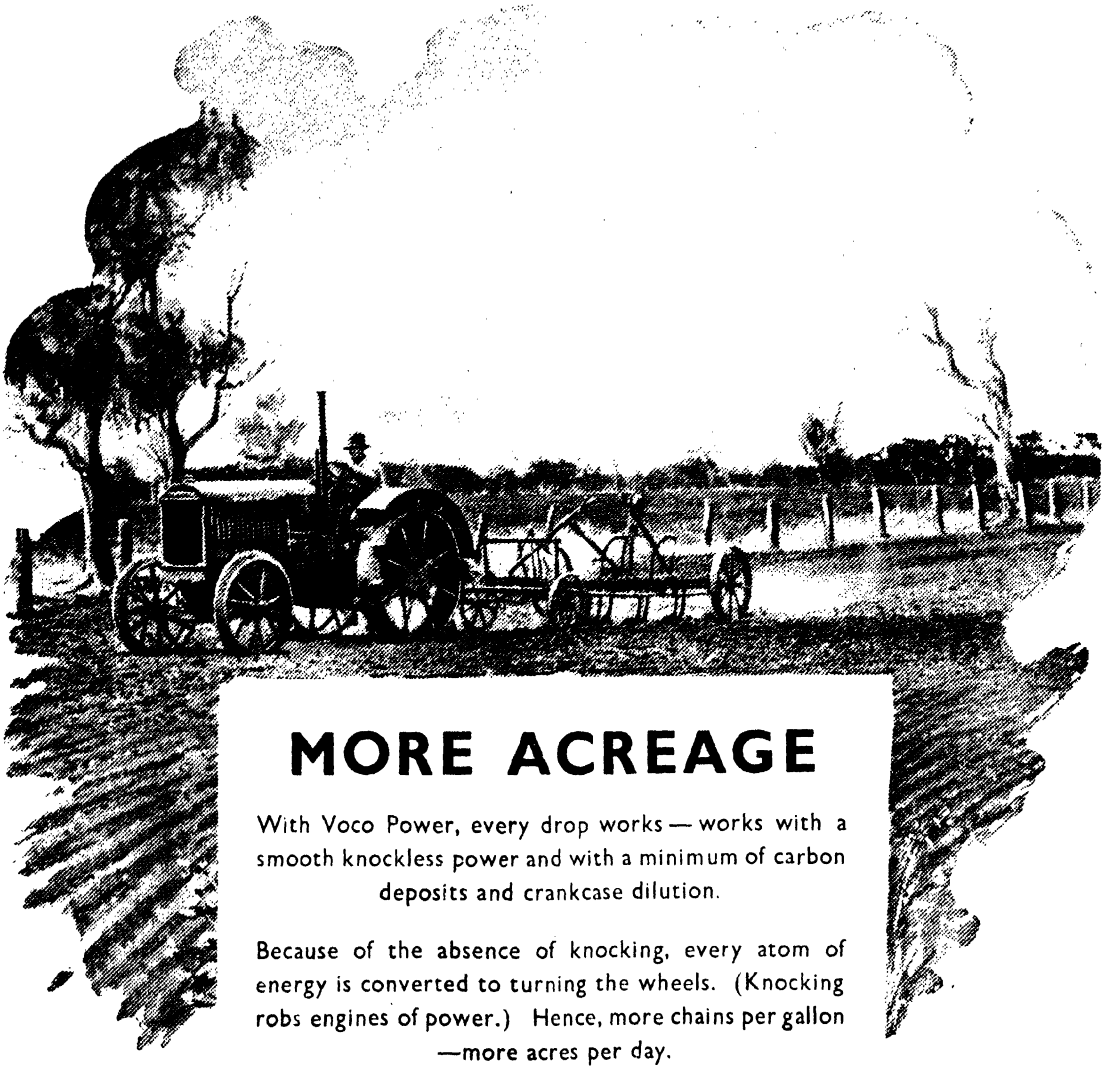
Fig. 7.—Diagram of Oblong Double-sided Hopper for Adult Birds.
In this drawing the hinged flap is open.

The free choice system can be adopted when grain is as cheap as mash. The advantage is the saving in not having to crush the grains, and the disadvantage the rather high consumption of meatmeal which may, at times, be in excess of requirements. Suitable mixtures of grains are wheat, maize, grain sorghum, barley and oats in various proportions, and the protein concentrates might be meatmeal or mixtures of meatmeal, linseed meal, coconut meal and peanut meal: 4 per cent. of salt should be added to this mixture.

TABLE I. SAMPLE ALL-MASH RATIONS FOR CHICKENS (0–6 weeks).

Ingredients.	All Mash Ration High Protein (20 per cent.); for Fast Growth.					All Mash Ration—Low Protein (16 per cent.); for use when Protein Concentrates are in Short Supply.
	lb.	lb.	lb.	lb.	lb.	lb.
Ground grain (wheat, maize or grain sorghum; barley may also be used, but only to the extent of 50 per cent. of a mixture).	34	44½	32½	34½	36½	43½
Bran	15	20	20	15	18	15
Pollard	15	20	25	15	18	15
Ground oats	10	......	......	10	......	10
Meat meal (50 per cent. crude protein)...	14	5	10	7	12	5
Buttermilk or skim milk powder (or liquid skim milk used to make up a wet mash).	5	......	5	5	......	5
Whey powder	......	......	......	......	5	......
Peanut meal	......	......	......	7	5	......
Linseed meal or coconut meal	5	5	7	5	5	5
Lucerne meal	5–10 lb., replacing that quantity of bran if no green feed.					
Liver meal	......	5	......	......	......	......
Ground limestone (or twice as much bone meal).	1½	......	......	1	......	1
Salt	½	½	½	½	½	½
Totals	100	100	100	100	100	100

* All plus vitamin D oils for battery chickens and vitamin A oils where no green feed is fed.



REFRESHER COURSES FOR EX-SERVICEMEN

SHORT (8 week) COURSES IN PRINCIPLES OF FARM MANAGEMENT

★

The next course will commence at Wagga Experiment Farm on approximately 22nd September, 1947. There are still vacancies for interested ex-servicemen

The Syllabus has been arranged by the Department of Agriculture. Specialist courses are available to the student in Sheep and Wool, Fat Lambs, Orcharding, Dairying, Pig Raising and Poultry Farming. Instruction is also provided in the general principles of agriculture, animal production and elementary veterinary science, farm management and farm economics, farm engineering, farm carpentry, etc.

Applicants who are accepted for the course are eligible for payment under Commonwealth Reconstruction Training Scheme rates and free return rail travel to the School.

Applications from ex-members who have been successful in a ballot under the War Service Land Settlement Scheme, should be made to:
The Closer Settlement and Returned Soldiers Settlement Branch,
Department of Lands,
Sydney.

All others must apply through:
The Deputy Co-ordinator of Rural Training, N.S.W.,
Department of Agriculture,
Box 36A, G.P.O., Sydney.

Applicants for training should indicate the specialist group they wish to join.

Combined Wet and Dry Mash Feeding.—As far as labour is concerned there is no advantage in feeding a partial feed of wet mash in the mornings and having dry mash available in hoppers which are opened later in the day.

The only merit of this system is that no judgment is required in feeding, as the birds can satisfy their appetites with the dry mash after receiving the wet mash.

Nothing is gained by giving a full feed of wet mash and having dry mash available;

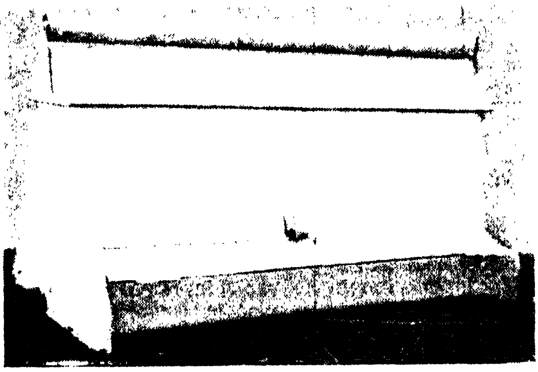


Fig. 8.—An Oblong Hopper.
Note that the hinged flap is closed. This hangs straight down the side when open. The roller along the ridge prevents birds roosting on the hopper.

this method increases the cost and work through having to provide the dry mash hoppers and issue the feed to fill them, as well as feeding a wet mash.

Mixing Wet Mash.

Most large commercial farms have power-driven mash mixers for mixing wet mash, but where the mixing is done by hand and the mixture is made up on the farm, labour can be minimised by placing the bran, green feed, lucerne meal, meatmeal, etc., in the mixing trough (see illustration on page 438) and adding the hot, but not boiling water. These ingredients are mixed together, after which the pollard, wheatmeal, or other fine meals are added and the whole mixed to a wet, but not sticky, consistency for adult birds, or to a crumbly state for chickens.

Small quantities can be mixed by hand in a bucket or tub, while larger amounts are more easily handled in a specially made trough and mixed by a blunt pronged hoe and, if necessary, finished off by hand.

Rations for Chickens.

Details of sample chicken rations are given in Table I. These should be continued until the birds are six weeks old when a change may be made to dry mash and grain, using the mashes as for laying stock. A low protein ration which will give only slow growth is included, as at times the protein concentrates necessary for high protein rations are hard to obtain.

Rations for Adult Birds and Chickens Over Six Weeks of Age.

Table II shows sample rations for laying stock. These are also suitable for chickens more than six weeks old.

Rations for Breeding Stock.

All the laying rations supplemented with 10 per cent. or more of milk powders or liver meal (5 per cent. for all-mash rations), or made into a wet mash with skim milk, together with all the fresh green feed the birds will eat, are suitable for breeding stock, *i.e.*, will ensure a good hatch from fertile eggs. If mill offals are less than 25 per cent. of the total ration, 1/5th oz. of manganese sulphate per 100 lb. of feed is advisable.

Green Feed and Fish Oils.

Green feed is an excellent source of vitamin A (which is essential for all stock), riboflavin (which is likely to be deficient in chicken and breeding rations) and the pigment which colours the yolk.

However, it is not essential in rations. Vitamin A-rich fish oils can provide vitamin A; lucerne meal, milk powder or liver-meal can provide the riboflavin necessary in

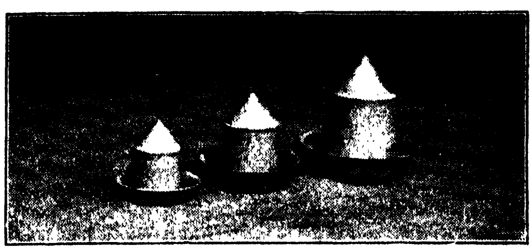


Fig. 9.—Chicken Drinking Fountains.

chicken and breeding rations; and lucerne meal or maize can provide the yolk colouring pigment.

The choice between green feed, or fish oils and lucerne meal will depend on the cost factor and the availability of the different

TABLE II.—SAMPLE RATIONS FOR CHICKENS OVER 6 WEEKS AND LAYING STOCK.

Mash Ingredients.	Mash for Mash-Grain Rations.						All-Mash Rations.			
	*1.	2.	3.	4.	5.	6.	*1.	2.	3.	4.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Ground grain (wheat, maize or grain sorghum; barley may also be used, but only to the extent of 50 per cent. of a mixture).	...	47	40	18	70	37	40½	53½	73½	50
Ground oats	...	...	17	...	...	30	...	20	...	...
Pollard	60	20	20	30	...	10	25	10	10	20
Bran	32	20	10	30	...	10	25	10	10	20
Meat meal (50 per cent. protein)	7	12	6	5	5	10	3	6	3	2½
Peanut meal	...	...	6	...	6	5	...	...	3	...
Linseed meal	...	...	...	5	8	5	...	...	...	3
Coconut meal	...	...	...	10	3	...	...	...	...	4
Salt	1	1	1	1	1	1	½	½	½	½
Bone meal	...	...	...	1	2	2	...	...	...	...
	100	100	100	100	100	100	100	100	100	100

	Mash for Mash-Grain Rations.	All-Mash Rations.
Together with — Grain	Wheat, barley, maize, grain sorghum or mixtures, or oats as half the mixture.	[No grain is fed with all-mash rations.]
and Green feed	Lucerne, oats, barley, clover, etc., or 10–15 per cent. lucerne meal replacing some bran or pollard, plus vitamin A oil, or vitamin A oil alone.	Lucerne, oats, barley, clover, etc., or 5–7 per cent. lucerne meal replacing some bran or pollard, plus vitamin A oil or vitamin A oil alone.
and Shell grit	*Ad lib.* or 6 per cent. ground limestone, in the mash.	*Ad lib.* or a 4 per cent. ground limestone, in the mash.

* When bran and pollard are cheap and plentiful, these rations are probably the most economic. The mash for the mash-grain ration is best fed as a wet mash as, because of its bulky nature, it does not make a good dry mash. The other mashes containing smaller proportions of mill offals are probably best fed dry.

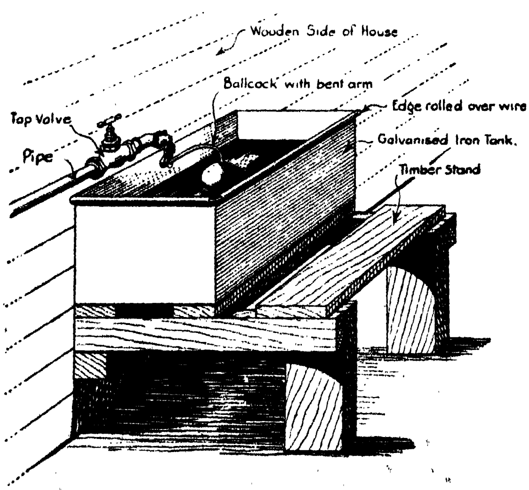


Fig. 10.—Water Trough Fitted With Ball Cock. Suitable for adult birds.

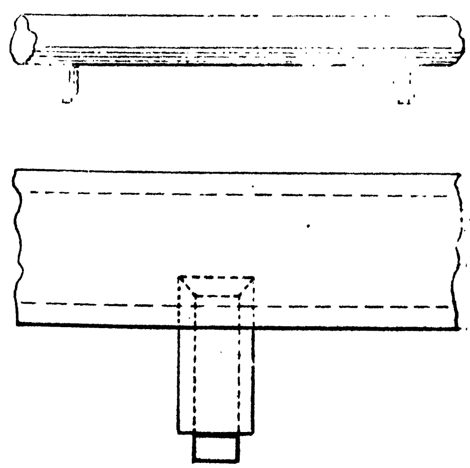


Fig. 11.—Diagram of Poultry Drinking Nipple.

Fig. 12.—Experiment Sheds at the Poultry Experiment Farm, Seven Hills.

feeds. Where fish oils are used to provide vitamin A the quantity required varies according to their potency. For instance, an oil containing 1,000 international units of vitamin A per gram should be used at the rate of 5 fluid ounces (¼ pint) per 100 lb. of an all mash ration, and at 11 ounces (a little over ½ pint) per 100 lb. of mash for

£50 in Prize Money

FOR A PRACTICAL METHOD OF PRODUCING CLEAN EGGS.

Egg Producers' Council Competition.

THE Egg Producers' Council has decided to offer a prize of £50 in a competition for the best practical suggestion for ensuring the production of clean, unwashed eggs on farms.

It has done this because of the urgent necessity for encouraging clean egg production as the result of the ban on washed eggs imposed by the British Ministry of Food.

The competition is being conducted in conjunction with the Egg Marketing Board of New South Wales and the New South Wales Department of Agriculture, and a Committee consisting of representatives of these two organisations has been set up to conduct the contest. Any person is eligible to compete.

The following give a general indication of the Committee's requirements, but competitors will not be confined to these suggestions, and any other economic method of producing clean unwashed eggs may be submitted.

(a) The design and manufacture of a cheap, effective nest.

(b) A method of keeping birds' feet clean on entering the nest.

(c) A method of preventing breakages in the nest.

The Committee reserves the right to conduct practical tests, if considered necessary, of any entry received. All entries may be used for the benefit of the poultry industry.

Entries to the competition should be forwarded to the Acting Secretary, Egg Marketing Board for the State of New South Wales, Box 16, Post Office, Pyrmont, and marked "Clean Egg Competition."

ENTRIES CLOSE 31st AUGUST, 1947.

The Judges' decision will be final; no correspondence will be entered into in respect of prize allocation.

a mash and grain ration. Oil containing 5,000 units per gram would only need one-fifth of these amounts.

Where chickens or laying stock are kept in batteries with no sunlight, vitamin D must be supplied by fish oils. "All mash" rations for chickens would need about 7 fluid ounces (approximately 1/3 pint) of oil containing 100 chick units of vitamin D per gram. With laying stock fed on mash and grain rations, three times this amount would be required. Oil with 500 units per gram would need only one-fifth of these amounts.

QUANTITY OF FEED REQUIRED FOR ADULT BIRDS AND CHICKENS.

Nothing definite can be laid down regarding the quantity of feed required by adult birds, as this varies a good deal according to the weather conditions, the rate of laying and the method of housing, etc., but it will usually be found that hens in laying condition will consume approximately 2 ozs. of mash and 2 to 2¼ ozs. of grain per day—or 12½ lb. of mash per 100 birds and 12½ to 14 lb. of grain. However, when the birds are in a moult they may not eat much more than half these amounts.

Where the dry mash and grain or all mash systems are used, the feed is provided *ad lib.* in hoppers, but if wet mash and grain is fed the appetite of the birds has to be studied and they should be given as much as they will consume in about an hour at each feed.

It is more difficult still to state definitely the quantities consumed by chickens, but the following quantities per 100 chickens per week up to 24 weeks, based on the food consumption in experiments carried out by the Department, will be found fairly close to average requirements:—

FEED CONSUMPTION OF CHICKENS—TOTAL OF MASH AND GRAIN PER 100 BIRDS.

	lb.
1st week	10
2nd week	20
3rd week	30
4th week	40
Total 1-4 weeks	100
5th and 6th week	115
7th and 8th week	140
Total 1-8 weeks	355
9th and 10th week	170
11th and 12th week	200
Total 1-12 weeks	725
13th and 14th week	220
15th and 16th week	230
Total 1-16 weeks	1,175
17th and 18th week	240
19th and 20th week	250
Total 1-20 weeks	1,665
20th to 24th week	500
Total 1-24 weeks	2,160

Apiary Notes—*continued from page* 436.

honey bee for any person to be able to make definite statements in respect of the effect of particular breeding systems on most characteristics of bees.

Artificial Insemination of Bees.

So far the use of artificial insemination has been limited to the production of a few breeding queens and at present the method is not economic for commercial apiculture.

Moreover the majority of artificially inseminated queens are only "partially inseminated," becoming partial or total "drone-layers" after a short period. They are, therefore, inferior to the average naturally-mated queen for introduction into commercial hives.

Future Transit of Bees by Air.

Recent developments in the transport of bees by air indicate that once the airline companies have been "educated" to the requirements of this class of business, there will be a very considerable increase in the shipment of queens over long distances, by air.

Cattle Consigned for Slaughter.

Procedure in Case of "Suspects."

"I RECENTLY consigned some cattle to Flemington saleyards, and amongst them was one which I have now been advised was a 'suspect', as it had a large lump on one jaw. It appears that I should have had the animal examined before sending it to Sydney. Can you please tell me why it was classed as a 'suspect'? What is the normal procedure with such animals?"

Replying to the above inquiry, Mr. J. N. Henry, Acting District Veterinary Officer (Orange) advised:—

"From your description it would appear that the animal referred to was probably either affected with T.B. or actinomycosis, sometimes referred to as 'lumpy jaw.' Under the Cattle Slaughtering, Diseased Animals and Meat Act, it is an offence for anyone to sell or consign for sale any animal which is diseased, and for the purposes of this Act tuberculosis, actinomycosis, cancer and anthrax are diseases. However, for many years it has been permissible for certain animals which are suspected of being diseased to be forwarded to specific meatworks and slaughter-houses for slaughter under supervision.

"The obligation rests with the owner of the cattle to advise his local Inspector of Stock that he has an animal which he thinks might be diseased. An inspection will be made, and if, in the opinion of the Inspector of Stock, the animal is fit to be consigned for slaughter, he will issue the necessary Order for Movement and at the same time mark the animal in order that it may be identified upon arrival at the meatworks.

"Animals that are affected with discharging lesions of actinomycosis or tuberculosis will not be allowed to be forwarded for slaughter for obvious reasons. Nor will permission be given for movement of the animals if they are emaciated due to tuberculosis or affected with malignant growths of such a nature that cruelty would be caused by keeping the beast. In these cases the animals must be destroyed on the holding.

"By allowing certain animals to proceed for slaughter a stockowner is able to obtain at least some value for the beast, particularly where upon slaughter only certain parts of the carcase are condemned. At the same time the cattle industry is protected, as in no case will an Inspector allow a beast to be forwarded which might be a serious source of infection to other stock. Human health is also safeguarded, as such animals may only be consigned to a meatworks or a slaughter-house where efficient meat inspection can be carried out."

Improvement of Native Trees by Pruning or Lopping.

THE value for shade and shelter of such native trees as the farmer has had the foresight to spare in his general clearing operations can often be considerably increased by the application of certain principles of forestry. A large proportion of the indigenous species are naturally fine shade trees, but there are many instances where judicious lopping or pruning is very advantageous.

This is especially the case with the eucalypts. Although some of the gums, boxes, ironbarks, etc., make excellent shade trees without artificial aid, a large proportion are too sparse in the foliage and of poor shape for efficient shading. Such trees can be greatly improved by cutting, as the majority of the eucalypts produce heavy coppice or sucker growth. Dead and diseased branches should be cut out, the older branches shortened back, and cuttings made to bring the tree to the desired shape.

For shade purposes a large spread of branches and the development of dense foliage is required rather than great height growth and sparse foliage, and it often pays, in the case of tall trees, to lop the main stem 30 to 40 feet from the ground to encourage the formation of lateral development. By such cuttings the amount of wood is considerably reduced, but as the remaining portion has the full root system of the original tree to draw on, thicker and denser growth results. In many paddocks it is common to see trees which are of little value for shelter purposes, but which if pruned or lopped would be considerably improved.

In addition to the eucalypts, most other trees are improved by careful cuttings. In the western areas trees which have been lopped for fodder very often throw out compact new growth which makes them much more useful as shade trees. In passing through paddocks where the trees have been carefully lopped a season or so previously, one is frequently struck by the marked improvement in shape, beauty and shading quality of such trees in comparison with unlopped specimens. Planted trees also require pruning and cutting, but the necessity for such work is generally most apparent in the naturally occurring trees.

Although the majority of native trees make good sucker growth and respond well to prunings, other species, particularly the conifers, are unable to sucker, and should therefore only be pruned to remove dead, diseased, or unwanted branches.

Winter and early spring, are the best seasons for lopping or pruning, the most suitable time being when the tree is at a resting stage but about to make new growth.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingah.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingah State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixson, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn	65
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
New England Experiment Farm, Glen Innes (Jerseys)	49
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forrest (Aberdeen-Angus)	24
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	9
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	37
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
New England University College, Armidale	25
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	37
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	100	30/8/47
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)... ...	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	41	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	64	26/4/47
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	259	20/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37	5/8/47
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station	19	29/4/47
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)...	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	119	20/4/48
Yanco Agricultural High School, Yanco ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Barnardo Farm School, Mowbray Park ...	45	2/[illegible]/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brodie, A. D., Naman Park, Menangle ...	49	14/4/48
Brookfield Afforestation Camp, Mannus ...	197	12/7/47
Cameron, N., Montrose Armidale (late New England Girls School)	39	28/5/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ebsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	57	2/11/47
MacNamara. B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien. O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital ...	24	2/9/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	40	4/6/47
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boys' Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson Masonic School, Baulkham Hills	52	10/6/48
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter...	65	26/3/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, **Chief of Division of Animal Industry.**

Avoid Deleterious Substances in Wool when Baling.

More or less regularly each year a general complaint is sent out from Bradford regarding the amount of foreign matter—principally jute fibres—which gets into the wool. This jute does not take the dye so thoroughly as wool, and as it cannot be removed beforehand, being so hard to distinguish, it has to be removed after the cloth is made. Over £500,000 a year is the estimated cost of removing these deleterious fibres from the material.

There are three ways in which jute fibres can get mixed with the wool in the process of baling, and as far as possible these should be prevented.

When the woolpack is put in the press there are often found to be long strands of jute threads inside; these can easily be cut off and removed. It is a good idea to give the woolpack a shake outside the shed before putting it in the press. Occasionally the corners of the pack are cut down slightly to make a neater bale. The short threads should be taken out of the corners of the bale, or they will get into the wool. When sewing, if the ends of the threads are thrown carelessly on the floor they will probably be picked up with some of the wool and put into the press. A small bag should be hung near the press, and all these waste pieces of thread, etc., should be put into it to prevent them getting into the wool.

Points in Barn Selection of Maize Seed.

IN the production of maize the importance of planting only sound, bright, pure selected seed cannot be too strongly stressed. This will prevent losses which frequently occur from poor germination due to disease, insect infestation, or lack of vigour and vitality generally.

It is important also, of course, that the seed should be of a variety proved best suited to the district, as indicated in the Department's classified list of recommended varieties.

Seed selection may be done in the barn or in the field, but field selection is to be preferred, as it enables one to see the environment under which the ears are grown. It is a good plan when harvesting to throw seed ears of desirable type into a bag attached to the dray, for further consideration when opportunity permits.

It is now too late for field selection, but observance of the following points when selecting in the barn will be found well worth while:—

1.—Select ears which are heavy in proportion to their size when dry.

2.—Soundness, weight, plumpness, and good bright colour of grain are of more importance than depth of grain. Deep grain may be light and chaffy and of poor colour and feeding value.

3.—Select ears true to type or thoroughly representative of the variety.

4.—Avoid ears with wide furrows between the rows of grain.

5.—Soft, rough-dented grain is more likely to carry the infection of root, stalk, cob, and grain rot disease than medium-hard grain of smooth to medium-rough dent.

6.—Do not strive too much after small cores.

7.—Well-filled tips make a good show point, but poorly-filled tips do not necessarily disqualify otherwise good seed ears.

8.—Straight, regular rows are only a fancy show point, and need not be stressed greatly in selecting seed.

9.—Avoid selecting ears in which the grain is split, discoloured, or showing any external sign of disease.

10.—Also avoid ears which on being detached from the stalk show a shredded, stringy, or discoloured (especially pink coloured) stalk attachment.

11.—Avoid ears which shell grain with a stringy tip cap.—W. D. KERLE, Special Agricultural Instructor.

THE AGRICULTURAL GAZETTE FOR SEPTEMBER, 1947.

This Issue Contains:—

Editorial—

Safeguarding Your Interests

TYPICAL of many similar activities undertaken, with quiet efficiency, by the Department of Agriculture to protect the interests of primary producers is the effort made in the past two years to raise the standard of sprays and dusts sold for control of pests, diseases and weeds.

Two years ago, the public generally, and the farming public in particular, were at the mercy of some unscrupulous traders whose worthless products depended entirely on spurious claims as to their efficacy and on attractive labelling.

Apart from the loss of produce occasioned by lack of protection given by these worthless specifics, there was a far more important point at issue. Thousands of pounds of taxpayers' money are invested each year in scientific research to discover better methods of disease, pest and weed control. Results of such research have, in many instances, been outstanding and even revolutionary.

Recommendations based on those results, when made to the public, have often failed, not because of lack of merit in the recommendations themselves, but because of lack of merit in the proprietary brands of the insecticides, fungicides and weedicides which falsely claimed to contain the substances recommended.

The Pest Destroyers Act was passed two years ago to compel manufacturers to compound reliable specifics. Under that Act, all specifics must comply at least with standard specifications. That is done, in the first instance, by compelling proprietors to register their products. To qualify for registration those products must measure up to standards which guarantee their efficacy. Further, for the buying public's guidance, the Act also requires branding of all such substances to indicate that they are registered under the Pest Destroyers Act.

In theory, this should relieve all anxiety as to quality, and consequently efficacy, in all insecticides, fungicides and weedicides. In practice, that guarantee depends largely on effective policing of the Act, mainly to ensure that registered products on sale continue to measure up to the samples submitted to the Department of Agriculture when registration was applied for.

To ensure full compliance with the Act in that connection would require an inspectional staff many times greater than at

present employed by the Department. The buying public, however, has a responsibility to discharge. If the efficacy of any proprietary insecticides, fungicides or weedicides is suspected, that fact should be reported to the Department of Agriculture for investigation. In other words, the public can co-operate helpfully with the Department in policing this Act.

To the credit of reputable manufacturers it can be said that there is a growing desire on their part to bring their products into line with Departmental recommendations.

Short Courses in Principles of Farm Management.

For Ex-Servicemen.

THE first of these courses in this State, held at Wagga Experiment Farm, terminates on 6th September. It was attended by thirty-six trainees drawn from all parts of the State, who are agreed that they have received great benefit from the course.

On the other hand much has been learned during this first school. The trainees made many helpful suggestions which are being embodied in future programmes.

The thanks of the Department are due to many stud masters and farmers in the Wagga district, for permitting the trainees to inspect their properties and flocks, and to the Murrumbidgee P. and A. Society.

There are no vacancies for the next course, which is to start on 22nd September, but applications may still be made to attend the January course.

A Tobacco Experiment Station to be Established.

A TOBACCO experiment station is to be established on the New South Wales-Queensland border on a site to be selected by a committee representing New South Wales, Queensland and the Commonwealth. This decision was made by the Australian Agricultural Council when considering plans to improve and stabilise the tobacco-growing industry.

Work to be undertaken at the experiment station, said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) would include production of pure seed of the best varieties and strains of tobacco, experiments on fertilisers, testing of rotations and irrigation practices, and disease and pest control investigations. Improvement of yield and quality would be a major consideration in all experiments.

Pilot plots would be established in likely locations throughout the State to test their suitability for commercial tobacco growing. Work of that nature had been commenced last season, said Mr. Graham, but had been limited by shortage of staff and other factors.

His Department, said the Minister, would give every encouragement to growers to produce more high quality tobacco leaf to meet local requirements. A main factor restricting production had been dissatisfaction with prices obtained. Full consideration was being given to the Commonwealth's suggestion that the State should legislate to implement a proposed appraisal and marketing scheme for tobacco.

Agricultural Research Grant for University.

A SUBSTANTIAL donation has been made by the Rural Bank to the Sydney University, to assist in the investigation of three major problems in present-day agriculture. These problems are the investigation of cereal diseases, virus diseases and research into the decline of soil fertility in the wheat belt of New South Wales.

This grant will enable the carrying out of essential and extremely valuable research work, with very great benefit to Australia. In addition, the fact that this work will be done in Sydney means a better education and training for the students who go through our University, and the money being made available at this stage, is of particular value for those ex-servicemen training under the Commonwealth Reconstruction Training Scheme.

The Growing of *Nicotiana rustica*.

To Meet the Demand for Nicotine Sulphate.

W. M. CURTEIS, B.A., B.Sc.Agr., Acting Special Agronomist.

AUSTRALIA'S production of nicotine sulphate, or "black leaf 40," together with the small quantities available from overseas sources, falls far short of domestic requirements, and there is little likelihood of improvement in overseas supplies for some time to come. Nicotine sulphate is one of the most important insecticides, being widely used in this country for controlling a variety of pests in vegetable and fruit crops—particularly those against which DDT is ineffective—and also as a drench to rid livestock of internal worm parasites.

However, increase in local production of nicotine sulphate is possible through the growing of *Nicotiana rustica,* which is a close relative of the common tobacco plant grown specifically for the extraction of nicotine. Because of the urgent need for nicotine sulphate, the Federal Department of Commerce and Agriculture, the State Departments of Agriculture, and the firm of Felton, Grimwade and Duerdins Pty. Ltd. (an associated house of Drug Houses of Australia, Ltd.) are co-operating in a programme designed to promote continued production of *Nicotiana rustica* for nicotine extraction. Last year 300 acres were grown in Australia, and this year efforts are being made to increase the acreage considerably.

Farmers who have had previous experience in vegetable or tobacco production should have no difficulty in obtaining good yields and a very profitable return per acre from growing this crop. One man can comfortably handle 3 acres, or one man with two occasional helpers could handle 7 to 10 acres.

In New South Wales last year, yields of between 4,000 to 5,000 lb. of air-dry material per acre were obtained at Bathurst Experiment Farm and at Eglington in the Bathurst district on the private farm of Mr. F. Turnbull. Under less intense conditions yields of between 2,000 to 4,000 lb. were obtained by growers in the Tamworth, Wagga, Tumut, Mudgee, Bega and Texas districts.

Seed and Contracts Available.

The company will supply the seed free of charge, and pay a price of 11d. per lb. for dried material to all growers wishing to grow *Nicotiana rustica* under contract. Freight from country sidings to the company's depot in Melbourne will be paid by the company.

The net return to the farmer will, of course, vary according to the yield, but it is possible to obtain a net return of up to £100 per acre from growing this crop.

As nicotine sulphate is urgently needed in Australia, and the sowing season for this crop has arrived, any farmer who has suitable conditions as outlined below and desires

A Plant of *Nicotiana rustica*.

to grow it, should contact his local district Agricultural Instructor, or write direct to Drug Houses of Australia Pty. Ltd., Post Office Box 10, Rozelle.

The Plant.

The *Nicotiana rustica* plant is 2 to 3 feet in height, with yellow flowers. The leaves are broad, thick and leathery in texture, and contain the bulk of the nicotine—from 3 per cent. to 12 per cent., according to the variety of the plant and the conditions under which it is grown. The stalks of the plant contain smaller amounts of nicotine. While bearing some resemblance to the common tobacco plant, the *Nicotiana rustica* plant is smaller, more robust, and has a shorter growing period. It is also hardier and more resistant to disease.

Conditions Necessary for Successful Growth.

The conditions necessary to produce the growth of coarse and bulky leaves with a high nicotine content are as follows:—

Firstly, an area of fertile river flat with a soil having high humus and nitrogen content. Better results are obtained if the land has been previously cropped to pasture or a legume crop, such as lucerne or clover.

Secondly, the use of nitrogen fertilizers such as blood and bone, or sulphate of ammonia. These will increase the total yield and the nicotine content. Side dressings of sulphate of ammonia during the growth of the crop are also recommended.

Thirdly, ample soil moisture. The *Nicotiana rustica* plant needs a regular supply of moisture to maintain uniform growth, consequently, in districts which do not experience regular rainfall between November and January, irrigation of the crop is essential.

Growing the Crop.

In many other respects the growing of this crop is similar to tobacco growing. The seed is sown in covered seed-beds from the end of August to the beginning of October —the exact time depending on local conditions—and the plants are put out in the field as soon as the danger of frost is past.

Transplanting of the seedlings is best effected by a tobacco or cabbage planter, although hand planting can be carried out effectively for small acreages. The spacing which has been found to give the best results is 3 feet between the rows and 2 feet between plants in the row. This, while allowing space for cultivation in the early stages, permits the plants to fill the rows without stunting, with consequent suppression of weed growth.

During the early stages of growth in the field the crop should be dusted regularly with arsenate of lead or 2 per cent. DDT, to prevent insect infestation.

Numerous suckers or lateral growths appear during the growth of the plant. These suckers must be removed regularly; they must never be allowed to reach a length of more than 3 inches. Under normal circumstances, this procedure has to be repeated three or four times during the growth of the crop. Flower heads must also be removed as soon as they are formed.

These operations of topping and suckering are the most important in the care of the crop, and unless they are carried out carefully, the crop is of little value to either grower or manufacturer.

Harvesting and Drying.

Approximately four months after planting out the crop will reach maturity, this being evidenced by the leaves becoming thick and brittle and turning down at the tips and edges. Harvesting is effected by splitting the stalks down for three-quarters of their length, and cutting the plants off at ground level. They are then allowed to wilt until they can be handled without breaking off leaves.

The split plants are forked over sticks of a suitable length, and hung in a shed or kiln to dry. It is important to dry the plants as quickly as possible. Plants should not be sun dried, as this will result in a loss of nicotine.

The Australian Broadcasting Commission's broadcasts for discussion by listening groups for the period from September to February, 1948, will be given over the National Programme on Mondays at 8.40 p.m. E.S.T. The four series to be broadcast during the period are: (1) "When is a Group a Discussion Group"?; (2) "Is Social Security a Desirable End"; (3) "What About a New Conception of Freedom"?; (4) "Plain English".

The Problems of ADJUSTMENT IN AGRICULTURAL DEVELOPMENT.*

S. M. WADHAM, M.A., Professor of Agriculture, University of Melbourne.

THE people of the world at large might be divided into two groups—those who like changes and those who do not. In the former group are the young and impetuous; in the latter the timid and aged to whom a little stability, with its fancied security, has attractions which were perhaps not so apparent twenty years ago. The agriculturist may belong to either group, but if he is part of a modern community he ought to recognise the inevitability of change. The shorter the farming history of the land he works, the more likely is the need for change and re-adjustment.

Australian agriculture is essentially new. As a nation we started in a country in which cultivation was unknown, and in which even grazing was carried out only by wild animals treated as game by the native population. Everything we have done in developing our farming has meant changing the country.

The Wool Areas.

As grazing for wool production alone was the first of our farming industries to develop on a grand scale, I will start by referring to it.

Flocks, by their grazing methods, bring about considerable alterations in the botanical composition of the natural pasturage. From the point of view of necessary nutrients available in the soil, however, little harm may be done to the property as a whole if the stocking rate is adequately adjusted to the capacity of the herbage. It is true that, within the property itself, there will be some tendency for a transference of the nutrients contained in plants towards those places at which the stock frequently congregate; but given care this need not be important. This simple system of grazing can therefore continue for long periods with little or no deterioration of the property—always provided that those responsible for its management make certain that they understand the precise methods by which the more valuable grazing species are regenerated and the less valuable ones suppressed.

I am not in a position to estimate how far this criterion is satisfied in the various types of wool-producing properties scattered over the length and breadth of Australia, but I have seen quite a number of regions in which deterioration seems to me to have been marked. The task of the agricultural expert here is, first, to be able to recognise the plant communities which are characteristic of soil and climate in each district; secondly, to recognise when these have been or are being degraded by over-stocking; and thirdly, to work out the precise methods of stock management under which regeneration can be ensured—a large programme. but an important one if we are to be certain that some of our drier inland country is not passing along the same path of degeneration as parts of North Africa.

Changes Due to Intensive Grazing.

On the more intensive type of grazing property from which a considerable proportion of stock (whether cattle or sheep) are sold, the soils have to stand a rather greater drain of nutrients because of the extra amounts of such substances which leave the property in the carcases of the animals sold. Where such properties are of low carrying capacity and the ordinary soils fairly rich, the loss may be unimportant, but where stocking rates are high, the process of degradation of the nutrient reserves may become of real significance.

It is convenient to group here those dairy farms on which no crops are grown and where pasturage in the paddocks (or possibly conserved as grass hay) forms the whole, or nearly the whole, of the food for the herds. On such properties the drift of fertility to the paddocks around the homestead or the milking shed and the deterioration of those more distant is often marked.

On many properties in this group the farmers have realised during the last twenty years the change which can be brought about

* Extracts from the 1947 Farrer Oration, delivered by Professor Wadham during the State Conference of the Agricultural Bureau of N.S.W. held at Hawkesbury Agricultural College, July, 1947. The theme of the Conference was "The Rural World is Changing Too."

by the use of phosphates and sometimes of other chemical dressings to the soil. This is particularly true of most soils in the moister parts of the southern third of the continent, where the simple process of top-dressing with superphosphate is now regarded as an essential part of farm management.

Trace Element Deficiencies.

This, however, is by no means the whole story, and we have to recognise that such top-dressing is not the answer to the problem of declining fertility in all cases. Prominent among these are the soils in which phosphate fixation takes place and the other poorer types in which other nutrients than phosphate become deficient. In Victoria, thanks to the work conducted by the Department of Agriculture for the Pasture Improvement League, we now know that incipient potash deficiency is a matter of vital importance in some districts, while in every State trace element deficiencies of one kind or another occur naturally or have gradually developed in some localities. I need not enlarge upon the work which has been done by the Waite Institute or in Western Australia and other places in overcoming these deficiencies.

We can, of course, contemplate a continual increase in the number of chemicals which we add to our ordinary fertilisers, but the prospect of finding it necessary to work along these lines is somewhat alarming, and possibly some radical change in general farming practices would meet the case more effectively. The problem is, of course, by no means new.

The Hosier System of Dairying.

In Britain, the most striking change which has gradually taken firm root during the last quarter of a century has been the development of the movable cowshed under the "Hosier" system. This is particularly effective on the poorer types of soil and where considerable quantities of bought-in concentrates are fed. Each ton of such material consumed by the animals means a certain amount of nutrient matter returned to the soil. The results are striking in the immense improvement in the type and carrying capacity of the pastures treated in this way.

It seems reasonable to suppose that some adaptation of this system should give comparable results in appropriate dairying districts in Australia. If preliminary investigations show that such is the case, then it will be necessary to amend the legislation which governs the construction of milking sheds, and also to find farmers who have the courage to make the change and to withstand the almost certain contemptuous banter of their neighbours. Mr. Hosier had to battle his way through all these difficulties.

Cause of Change in Pasture Composition.

I referred earlier to the gradual change in the botanical compositions of pastures which takes place as a result of prolonged grazing. This may be due to one of two main causes. It may be that the available amounts of some element in the soil fall below the levels required for more effective grazing plants. Alternatively, it may be due to the selective grazing of the animal, which tends to suppress the more valuable species and leave those which are less worth. Instances of this are widespread, and one cannot but notice the number of properties with pastures which were once composed of highly nutritious species and which have gradually been invaded by other less productive or less nutritious types—except perhaps the paddocks around the homestead which have been enriched, and sometimes as a result have been invaded by prolific and aggressive weed species. This deterioration of the outer paddocks can sometimes be overcome by the use of fertilisers, but in many cases is, I believe, influenced by the vagaries of our fickle rainfall.

Improvement by Mixed Farming.

Under such circumstances improvement can often only be achieved by transferring from pure grassland farming to mixed farming practice. The pastures from which the better species have largely disappeared are ploughed up and ultimately re-sown, the cost of these operations being largely or wholly met by the cultivation of a cereal or other crop for one or two years after the land has been broken up. The extra fertility accumulated in the upper soil layers of a pasture can thus be "cashed" during this short period of cultivation.

While it is all very well to talk about a change of this type on theoretical grounds, the proposal often looks very different from the point of view of the farmer. In the first place, he may not be accustomed to growing crops; in the second, he frequently lacks the machinery to do so and quite frequently his farm is relatively small in size and thus a

disturbance of his normal practice may affect his annual working account. If the farm is, say, 100 acres, and he intends to crop only two years in, shall we say seven, he will have on the average about 28 acres under crop in any season. This is a small area for which to maintain a set of machinery, and if the farmer has to purchase it the extra capital involved is rather high. Then there is the trouble of finding the necessary labour to do the work at harvest time when everyone is busy and labour is most difficult to get in some districts.

Disease Control and Fodder Conservation Problems.

Let us turn to another aspect of the results of pasture improvement. In our moister districts on medium soils, where phosphate deficiency is the main obstacle to the establishment of better pastures, the addition of superphosphate frequently trebles the carrying capacity of the land. This is all very well on paper, but those of you who are in touch with the problem well know that other results almost invariably occur.

In the first place, much more attention must be given to the sheep in order to avoid the dangers of serious foot-rot and of worm parasites, for the appearance of these is more likely unless adequate precautions are taken.

The second and even more important consideration arises from the fact that the increased carrying capacity involves an increase in the stock on the property—and it is no use carrying more stock unless one has the capacity to carry them satisfactorily when the period of growth of the pastures is meagre.

This question of reserves is all-important in the case of dairying. I sometimes hear people refer to dairy farmers as "cow cockies." I object strongly to the term, but at the same time I am bound to admit that those dairymen who merely milk cows without due consideration of the food requirements of their herds deserve the epithet. Surely it is time that every person worthy of the title of "dairy farmer" should know the basic requirements of the cow's nutrition —firstly, that it must be well fed for the last two months of pregnancy; secondly, that it should be fed according to its individual yield of milk; and thirdly, that this involves giving supplementary rations, sometimes of dry fodder or even roughage, and sometimes of concentrated feeds high in protein.

New Leguminous Concentrates.

If a properly balanced feeding programme were generally carried out on dairy farms, there would be a need for reserves both of bulk feeds and concentrates. At the moment (or even under pre-war conditions) I doubt whether the necessary foodstuffs would be available. The majority of dairy farmers, when they want concentrates, seem to me to rely far too much on bran. It is high time we studied both the production and the use of alternatives. During the war we have, of course, used fair quantities of whole wheat, but it should be practicable to develop the cultivation of some species of leguminous seed which would be higher in protein and could be grown with advantage—the type would vary with the district.

Nothing which I have said should be taken as an inference that it necessarily pays to supplement the feed of dairy cows irrespective of the economics of the process. This will, of course, be governed by the relative prices of the foodstuffs and of the product of the dairy farm (whether whole milk or butter fat). Very few dairy farms are so advantageously placed that their cows would not be more efficient producers if supplements were used during part of the lactation, and especially during the period immediately preceding it.

Changes in the Wheat Areas.

Turn now to the wheat areas, in which I believe soil deterioration has gone a long way on many farms. The historical sequence is worthy of notice. Many pioneer wheatgrowers in the wheat belt proper started with fairly good soils and grew moderate crops when seasons were favourable. They were assisted as time went on by the development of special machinery and, in particular, by the work of the plant breeders, among whom Farrer was the giant of his day.

Repeated cropping was the common practice, but gradually it became clear that the gamble of the repeated crop was not a good one in most districts. On the medium and light soils farmers found that resting the land for a season gave a better result in the following year. On the heavier soils the

ancient practice of fallowing became frequent, but on some types within this category the degradation of the physical condition of the surface layers made wheat growing more and more speculative.

In the 'nineties the value of superphosphate was demonstrated. Its use was then a new practice to the wheat-belt, but it was really a recognition of the fact that years of cropping took so much out of the land that the amount of phosphate available had become insufficient for the needs of a healthy, productive plant. By 1910-20 the practices of alternating crop with fallow and of using superphosphate had become frequent in many districts. Sometimes the fallow was replaced by oats, and on a few farms the rotation was made longer still, crops of lucerne, peas, or barley being introduced according to the district.

By the 1920's farmers in the drier parts of the wheat zone, at least in South Australia and Victoria, were beginning to discover that a longer period of rest between crops produced good results. The land could be used for grazing during the intervening years, and with the increasing residues of phosphate in the soil the type of volunteer plant which came in on the stubble improved, while after the longer spell the wheat crop was usually a good deal heavier. Nowadays most farmers know this, and the increase in the number of sheep on wheat farms has been marked, although the drought of 1944-45 was a severe set-back to many.

The Requirements of a Longer Cropping Cycle.

This general observance of a longer cropping cycle requires three things—first, that the farm shall be large enough to give reasonable employment to the machinery and the capital invested in it; second, that the farmer shall learn what kind of sheep is suited to his property, and take the trouble to understand the proper management of his flock so that running them becomes a profitable enterprise; and third, that he shall conserve sufficient reserves to ensure that he is not caught without feed in the drought year when it comes along. Of course, it all means more trouble, but if we are not prepared to take that trouble, are we justified in claiming that we are progressive farmers?

"Ley" Farming is Desirable in Some Districts.

On some soil types it seems to me quite clear that a system of "ley" farming is immensely desirable. Under this, the land will, after being cropped with wheat, be put down under grazing which should certainly contain some form of leguminous plant. I said "put down" to grazing, for although "volunteer" species are sometimes quite satisfactory, this is not always the case.

After several years of this use of the land, the soils are cultivated much more readily and give greatly improved yields. This has been officially demonstrated on some experiment farms, and is becoming common practice by a good many men on medium or poor types of soil and in districts of moderate rainfall. Doubtless the prospective high price of wheat in the next year or so will give the movement a set-back, but the principles underlying it are sound.

Steady continued research as to the most satisfactory species of grazing plant to be used, and demonstration of the merits of the new system when compared on a basis of costs and returns, with other systems, ought to be a definite feature of the field investigations by those bodies which are interested in agricultural progress. The difficulty is to find satisfactory grazing plants or possibly alternate crops, especially of the leguminous type, which will make reasonable progress in the areas of low and uncertain rainfall.

There is Need for Greater Knowledge.

You will notice that these various changes which I have suggested as desirable in the agricultural systems of our different types of farming are all dependent on certain things. First, the acquisition and/or dissemination of more knowledge; second, in some cases, an adjustment of farm areas so as to make them more efficient in regard to machinery; third, the provision of such machinery in an economical way; and fourth, in some cases, extra labour to do the work. Each of these factors requires some comment.

I am painfully aware that we still have a lot to learn both in regard to the basal scientific facts, and also as to the most efficient methods of doing things. We know that on some soils this "ley" farming system works; what we don't know is what precisely happens in the soil which makes it easier to cultivate after it has borne a pasturage for

some years, and whether it is nitrogen or some other element which becomes more available during that period. Again, in regard to our pastures, we do not know precisely what is the most efficient means of putting by fodder reserves in each district or, equally important, the most efficient method of feeding reserve forage and concentrates out to livestock during a dry period. Nor do we know what sort of leguminous crop we can introduce into our drier districts with success. These are problems for the agronomist and other scientific workers in agriculture.

Areas and Machinery Must be Used Efficiently.

The second requirement, adjustment of farm area, is, of course, usually a difficult matter, and can only be worked out in process of time. If neighbours would work together more frequently than they do at present, we should be in a happier position because economies in the amount of machinery required can be arranged in so doing. In this way some of the smaller farms could be made more effective economically.

In any case, as regards the third requirement, it is probable that the most efficient way of putting aside reserves, particularly on grazing or dairying properties, is one which will require the use of large-scale machinery. Some progress has been made during the war in the development of machinery pools. Unfortunately, experience tells us that people are ready to do all sorts of things and make all kinds of allowances for other people during a period of national stress, but they are not so ready under normal conditions.

Clearly, there is a great need in two directions—first, for an accurate investigation of the costs of running machinery on a pooled plan, whether it be co-operative in character or run by the State; and second, for a study of the most effective means of getting groups of farmers to understand what is a reasonable basis for such a machinery pool or co-operative. Farmers who think of such an organisation merely as one from which they can get assistance just when they happen to want it, fail to recognise that membership implies obligations to as well as benefits from such an organisation if it is to work beneficially. I have been very interested to notice that the Economics Division of the New South Wales Department of Agriculture has started investigations of this kind. Where butter factories or other co-operative processing organisations exist, they have a great opportunity to spread the principle for which they stand among their members by taking an active part in such organisations.

Efficient Labour Must Be Obtained.

Finally comes the labour problem. In my opinion, few forms of farming can be efficient if conducted on the basis of one-man farms. The reasons have been stated elsewhere, and I will not repeat them here.

It is no use expecting to be able to maintain a form of farming which requires the employment of one or more paid workers if conditions in the labour market are such that these workers are not available. I do not know what the situation is like in New South Wales, but in most districts of Victoria experience suggests that there is an acute shortage of efficient agricultural labour. This difficulty is not likely to be overcome by sitting still. I suggest that we have to recognise that farm work has a bad name on the labour market, and until we can put that right, efficient workers will not become available.

The acceptance of some sort of guarantee by the farming industries, both as regards the wages which will be paid and the conditions under which farm workers will be expected to live, seems to me very important. I don't know whether the right course would be to deal through the normal machinery of wage-fixing boards or arbitration courts, but personally I am attracted by the thought that it should be practicable for groups of farmers or for farmers' organisations to get together and draw up reasonable standards which they would guarantee to prospective employees. It may be that this would be such a departure from pre-war practice that farmers would not be prepared to enter such a scheme, but in my opinion this would be the best solution of the problem.

As regards housing on farms, some approach to housing authorities generally may be necessary. Developments of this kind have been the normal procedure in England for about twenty years, and I don't see any reason why the problem of improving housing levels on farms should not be as much a matter of national concern, as is the abolition of slum areas in cities.

These Problems Must Be Solved.

I chose this subject, not because it is of great scientific profundity, but because of its importance. In many districts one can see so many instances of farms which are not well run, pastures which are poorer than they should be, crops, the poor yields of which are not solely due to climatic vagaries, stock which are not reasonably well fed even when there is no question of a drought, or soils which although not eroded, tread very hard under the foot and could probably be made far more tractable and more fertile. It would be interesting to discover whether the causes lie in financial poverty or in lack of courage to strike out a new line, or in blind satisfaction with things as they are and refusal to recognise what they might be, or to pure laziness and inertia.

Whatever the causes, they are the main obstacle to agricultural progress in this country, and unless we can overcome them we shall remain among the less progressive agricultural nations of the earth—blaming our droughts rather than grasping the need for mitigating their effects.

Approved Vegetable Seed—September, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in *The Agricultural Gazette* were published in the November 1946 issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Corowa (W. T. Easdown)	September 12, 13
Singleton (N. Shaddock)	September, 17, 18, 19
Molong	September 19, 20
Ardlethan	September 20
Eugowra	September 23, 24
Leeton (L. C. Tweedie)	September 23, 24
Quandialla	September 24
Junee	September 26, 27
Ariah Park	September 27
Bribbaree	October 1
Walbundrie (C. Leischke)	October 1
Hay (G. Johnston)	October 3, 4
Goolgowi	October 4
Illabo	October 4
Culcairn	October 4
Albury Annual Spring Show (A. G. Young)	October 7, 8, 9
Kyogle	October 8, 9
Cootamundra (D. Boyd)	October 10, 11
Hay	October 14, 15
Lismore National	October 14, 15, 16
Alstonville	October 22, 23
Holbrook (Thelma Stewart)	October 24, 25
Murwillumbah	October 29, 30
Griffith	October 30, 31.
Mullumbimby	November 5, 6.
Bangalow	November 12, 13
Nimbin	November 19, 20

1948.

Bega (Jas. Appleby)	February 26, 27, 28

Richmond Wonder French Bean.

A New, Heavy-yielding, Disease-resistant Variety.

N. S. SHIRLOW, B.Sc.Agr., Agronomist.

A NEW variety of French bean—Richmond Wonder—has been produced at Hawkesbury Agricultural College. It combines disease resistance with heavy yields of long, straight, fleshy pods. Seed is not at present available for distribution to growers, but steps are being taken to increase seed as rapidly as possible.

The variety Richmond Wonder has been evolved as a result of a cross, Clarendon Wonder by Wellington Wonder, made by the author at Hawkesbury Agricultural College in 1940 with the object of producing a disease-resistant variety with long pods and heavy cropping capacity.

The value of the new variety for commercial growing lies in its comparatively good resistance to halo blight and angular leaf spot, better cropping capacity than Hawkesbury Wonder in hot weather, and maintenance of an attractive appearance, even to an advanced stage of maturity.

Clarendon Wonder was chosen as a parent because it was desired to incorporate the resistance to halo blight and the large fleshy character of the pods of this variety in the new bean. Clarendon Wonder, which was also bred at Hawkesbury College, is of the same breeding as Hawkesbury Wonder, now an important commercial variety.

Wellington Wonder (Peerless) is a heavy cropper with long slender pods; it is later maturing than Clarendon Wonder and not particularly disease resistant. It was used as a parent mainly on account of length of pod and cropping capacity.

The New Variety Described.

The following is a description of the new variety, Richmond Wonder:—

Plants, large (taller growing than Hawkesbury Wonder) at maturity, without runner; vigorous, hardy, and heavily productive over a fairly long period; matures seven to eight days later than Hawkesbury Wonder; stems short; foliage abundant, dark green; leaflets large; flowers lilac.

Pods borne amongst the foliage, fleshy with fairly heavy string and fibre with age; shape, long, straight, oval in cross section; length 9 to 10 inches containing six or seven seeds per pod; depth ½ to 9/16 inch; colour medium to dark green; point of pod straight to slightly curved.

Seeds, large, long, straight to slightly curved; nearly round in cross section; straight to slightly concave at hilum; colour reddish plum, with a narrow dark eye ring.

Richmond Wonder Bean.
Note the heavy yield of long pods.

Mr N. S. Shirlow in a crop of Richmond Wonder Beans at Hawkesbury Agricultural College.
[See description of this new variety on page 459.]

Increased Fodder Conservation Advances Available.

To Purchase and Store Drought Reserves.

SUBSTANTIALLY increased advances for purchase and storage of fodder as drought reserves are provided for by the recently amended and expanded New South Wales Fodder Conservation Scheme.

Advances to individual farmers for purchase of fodders for storage have been increased to £500. Co-operative dairy and rural societies may now obtain advances up to £10,000. Maximum advance to a co-operative society under the old scheme was £1,000 for purchase of fodder and £1,000 for storage.

The Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has supplied further details of the amended and expanded scheme recently announced by the Premier (Mr. McGirr).

Advances were made at a very low rate of interest (1½ per cent.), said Mr. Graham, and in the case of individuals were repayable over three years.

Co-operative societies could use the advances to purchase and store fodder on their own account. They could also purchase and supply to their shareholders fodders for storage against drought, or, alternatively, they could issue orders to dairy farmers to purchase fodders for such purpose. In those cases, the society would pay the supplier when the fodder was delivered to a farmer.

Producers and co-operatives, said Mr. Graham, would be wise to make full use of the scheme during the present favourable season, when fodders for storage as an insurance against drought could be purchased more readily and cheaply than in time of scarcity.

In addition to advances for purchase of fodder, the scheme made provision to assist farmers to grow and store fodder on their farms. The following were the rates of advances:—

(a) Silage (in dairying districts) 17s. 6d. per ton.

(b) Silage (in inland areas) 10s. per ton.

(c) Lucerne hay 30s. per ton.

(d) Cereal hay 25s. per ton; (baled) 35s. per ton.

(e) Grass hay 20s. per ton.

(f) Straw (loose) 15s. per ton; (baled) 25s. per ton.

Advances per bushel against grain would be:—

(a) Maize 3s. per bushel.

(b) Oats and barley 2s. per bushel.

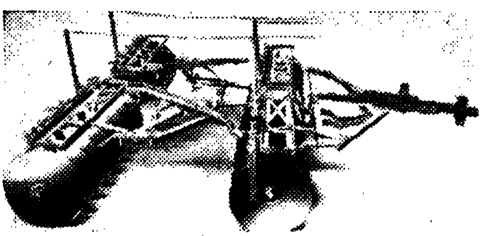
Financial assistance was also available for construction of pit or trench silos, or overhead silos for the storage of green fodder or grain, and for the erection of storage facilities such as hay sheds and mouse-proof grain sheds. Finance was also available to defray costs of pasture improvement.

Application forms for advances under the scheme were available from branches of the Rural Bank or from the Rural Industries Agency of the Rural Bank, Sydney.

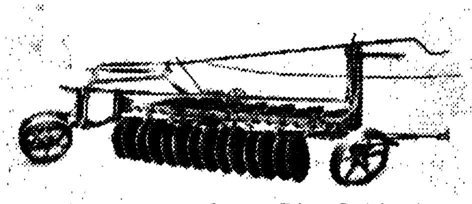
GL156-24

INTERNATIONAL HARVESTER

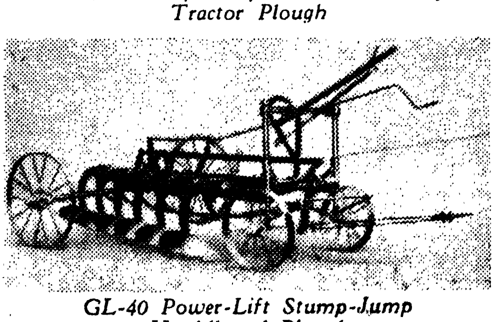
McCormick-Deering Model W-6 Tractor



GL-9A Tractor Disc Harrow



GL-90 Stump-Jump Disc Cultivating Tractor Plough



GL-40 Power-Lift Stump-Jump Mouldboard Plough

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HAYMAKING

A Means of Conserving Fodder

That is Palatable and Nutritious.

(*Continued from page* 355.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

THIS article commenced in July issue. In the first instalment the advantages of hay as a stored fodder were outlined and the factors which affect quality in hay were discussed. A commencement was made with a description of the production of cereal hay, and advice was given on varieties, cutting, binding and stooking.

In this continuation, the chaffing of hay is described and particulars are given of handling the several cereals used for hay making.

Chaff Cutting.

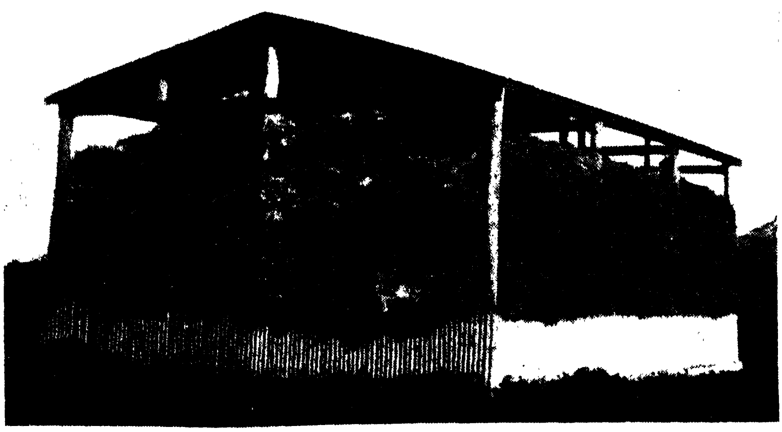
The process of chaffing cereals is more popular in Australia than in any other part of the world. Frequently the work is carried out by contractors. The farmer should take care that no material spoilt through the entrance of rain to the stack, or showing any mould, is included in the sample, as such inclusions decrease the value of the whole parcel for sale purposes. Where chaff is produced for sale it pays to market in new bags, and all steps should be taken to ensure an attractive market get-up.

Steaming.

Where hay is chaffed by contract the farmer should insist on the use of the steamer, particularly in dry districts. The object of steaming is to toughen the hay so that it cuts cleanly without breaking and powdering. It may be necessary to steam in cool districts where conditions have been very dry during the curing of the hay, and this kind of weather persists to the time of chaffing. More steaming is required at the top of the stack where moisture losses are greater than from the body of the stack. With a little experience the flow of steam can be judged very well by watching the condition of the chaff as it comes from the cutter.

It is advisable to use high-pressure, dry steam, as with wet steam there is a danger of causing mustiness, particularly if the hay itself is a trifle damp. The best results are obtained when a pressure of 90 lb. per square inch or more is maintained. Steam pipes should be placed on the engine in such a position that dry steam is obtained, and to that end the offtake should be from

A Hay Shed at Gilgandra.



the steam chest and not from the smoke box, or exhaust steam, end of the boiler. Dry steam can frequently be drawn satisfactorily from the whistle pipe, in which a T-piece for the offtake can be inserted.

Some large plants have an offtake for both wet and dry steam, the operators claiming that by this means the moisture content of a chaff sample can be controlled more accurately. The addition of a small amount of moist steam may be advantageous with a dry or flaggy sample, but the practice is viewed with suspicion, as although the weight of chaff produced is increased, there is the previously mentioned danger of mustiness developing in the bag, even with a skilled operator.

The hay naturally becomes heated in passing through the steamer, and in the bag has a hot, slightly damp feeling. However, provided the hay is quite dry before steaming and dry steam is used there is no danger of fermentation in the bag. The bag sewer should be warned to watch for any bags coming through which are not quite up to standard, and these should be put aside for home use, as otherwise they may reduce the value of the whole line.

Cutting.

Several types of cutter are available, differing in capacity. The grower should watch plants at work in the districts and select a type suited to his requirements.

The "runs" should not be too great—so that the knives become blunt—as when this occurs the chaff is broken up and smashed, giving an uneven sample. The length of a run depends on the type of plant and its size, and is also affected by the class of soil from which the hay was taken. When hay containing gritty material picked up from sandy soils is being cut the edge of the knife spoils quicker than when cutting hay grown on a clay soil. For small machines, 25 to 30 bags, or 1 to 1½ hours running, would be a reasonable period between sharpening, while with some of the larger machines with convex blades, up to 100 to 125 bags of chaff are sometimes cut in a run, the knives being sharpened only four or fives times per day. The final test is when the knife begins to break the chaff rather than to cut it cleanly. The knives should then be sharpened without delay, particularly with flaggy hay, as the presence of dust and broken flag detracts greatly from the appearance of the sample.

The bevel on the knives should be approximately ½ inch wide and it should be even throughout the length of the blade. For good, even fast cutting it is important that this straight bevel be maintained; under no circumstances should it be allowed to become rounded. To cut a good sample it is essential that the blades be set close to the mouth plates, evenly from the heel of the blades to the end. The knife wheel should be set firmly so that the blades remain close against the face plate when cutting. Sometimes the wheel becomes loose. This can be detected by pushing against it, away from the face plate; if play is detected, the wheel can be adjusted by means of the set screws. With a loose wheel, when the knives are being set they may be apparently tight, but when the machine is put in operation the wheel springs away from the face plate.

By following the above points quite a fair sample of chaff can be produced, even from inferior "flaggy" hay. The object in dealing with hay containing an undue proportion of leaf, is to prevent the flag being broken into dust; this can be achieved by care and attention to every detail in the machining.

Chaff Standards.

Standards for chaff are fixed by the Department of Agriculture in consultation with producers and buyers, in January of each year. The object is to provide a standard on which chaff can be confidently bought and sold and the particular advantage of the scheme is that it facilitates trade. When samples of the standards are seen, producers know what buyers require, and sales can be made without the parties actually meeting, which is of great assistance to producers in the country.

The use of the standards also provides an easy way of settling differences, and the system of selling on standards prevents the rejection of chaff on the grounds of quality, when the market is falling.

It is not compulsory to sell chaff on the standards but the practice is now largely adopted by the trade.

For wheaten chaff three standards are fixed, viz., prime green wheaten, and No.

A Stack of Hay on a Straddle.

1 and No. 2 wheaten. Similar standards are fixed for oaten chaff.

The Selling of Hay.

Where a crop of hay is grown for sale, several methods are available for its disposal. The crop may be sold either in the form of hay or chaff. Merchants operating in the principal hay-growing districts will buy a standing crop of hay in the field, in many cases, either at a certain price per acre, or more usually at so much per ton over the Government weighbridge. When bought in this way, the merchant may arrange for the grower to cut and cure the crop for him on contract, or arrange for cutting by an outside contractor or with his own plant.

Hay is also sold in the stook and on rail. Some contracts have what is known as a "2-inch rainfall clause," specifying that where 2 inches of rain falls while the crop is standing in the stook, the merchant has the option of either rejection or purchase at a lower price by fresh negotiation with the grower. Such clauses, however, are not as common as formerly, and the merchant usually bears the full risk from the time of cutting onwards.

Wheaten Hay.

Wheat is cut for hay at the flowering stage or immediately after, when a good weight of hay is obtained of high nutrient value. If cut later when the grain is formed a higher yield is obtained, but palatability and nutritive value are sacrificed, while the presence of grain, particularly in wheaten hay, makes the product more susceptible to mouse damage. Where a large area is to be cut, it is better to start a little early with the cutting than to wait until all the crop has commenced flowering, for in the latter case the latest cuts will be a little past the right stage of maturity.

One test used by growers of wheaten hay to determine when the crop is ready, is to seize a stalk by the head and give it a sharp tug. If the head snaps off at the top of the stalk, or if the whole plant pulls away at the root, then the plant is mature enough for cutting. If the head comes away bringing with it the portion of stalk between the head and first node, which pulls out of the rolled-up leaf surrounding it, then the crop is considered to be too sappy and young for cutting. Sappiness increases the difficulty of curing when weather conditions are at all damp and unfavourable.

Quite a large proportion of the wheat crop is cut for hay, even if only to provide chaff for working horses. The cutting of headlands and strips through the hay at flowering is an excellent method of preparing firebreaks, the efficiency of which is improved if ploughed and left rough.

The usual method of harvesting is with the reaper and binder, but cutting with the mower and pressing has the value of easier handling and less damage by vermin. A good hay wheat should be a tall grower,

with plenty of good clean stalk free from dead leaves, and should dry out heavy and retain a good colour when cured. For preference a variety which is not brown-chaffed should be used. Properly cured wheaten hay compares very favourably with prime oaten hay in feeding value.

The principal wheaten hay producing areas are the South-western Slopes and Eastern Riverina, where large areas are cut annually. Appreciable areas of wheat are also cut for hay in the central-west of the State.

Quite a lot of hay is cut in some seasons by farmers who had originally sown for grain, but because of frosting, dry weather, or other causes have to cut the crop for hay and subsequently chaff it. Under these conditions, the farmer cannot expect to get the same quality as that obtained by the grower who has sown a hay variety and cut at the right time; more especially when cutting has been delayed as long as possible in the hope of getting a grain crop, the straw in the meantime losing all the colour that would recommend it for hay. In such cases, the farmer should endeavour to cut at the earliest possible moment once he is satisfied that a profitable grain yield will not be obtained.

Sowing.

The general rule in regard to rate of sowing is that a lighter rate should be employed where soil moisture is likely to be deficient at some stage of the growth of the crop, than where ample soil moisture is available, as for instance on the coast and tablelands. On the coast where the rainfall is higher, heavy rates of seeding are used, up to nearly 2 bushels per acre being used where broadcasting of the seed has to be carried out.

The average sowing rates recommended for inland districts are 40 to 60 lb. to the acre, according to the maturity group of the variety. A long maturity variety (sown early) is seeded lighter than an early maturing type (sown late). Superphosphate should be used at the same rates as used for grain crops.

Eating off Growing Crops.

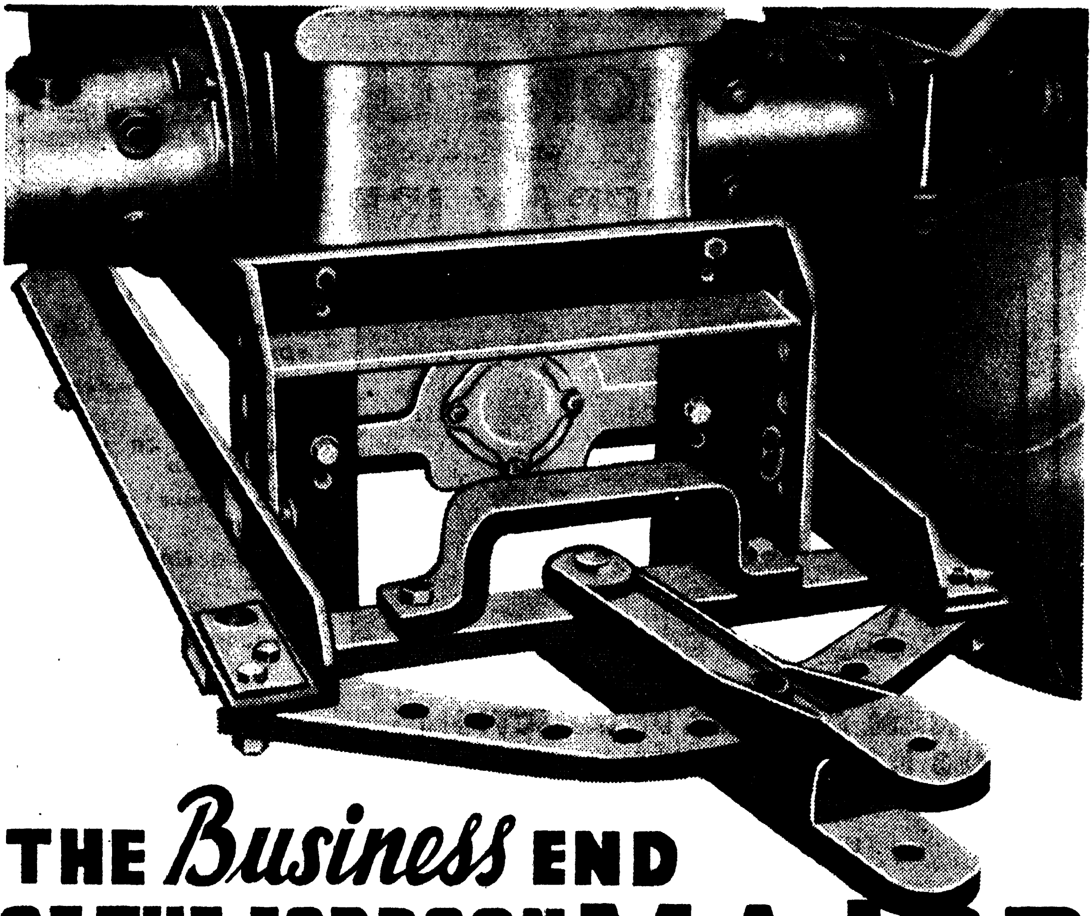
The grazing of wheaten hay crops is not recommended, except where a rank, sappy growth is developed by the young crop. Even then grazing may safely be carried out only when the crop is in the "grass tuft" stage—up to, say, 9 inches high, and before the initial development of the seed head at the base of the young stem shoot. If allowed to grow too long, not only are the seed shoots injured, but it is impossible to get sheep to eat the crop off properly, the bulk of it being merely trampled down and wasted. Generally speaking, grazing affects the total yield of any cereal crop whether grown for hay or grain.

Oaten Hay.

In recent years, the growing of oats for hay and grain in rotation with the wheat crop has increased in popularity, and there is every argument in favour of a still further increase in this practice. It is desirable to counteract the effects of "one crop farming" which are becoming more obvious in our wheat growing districts. Soil erosion, weed growth, and disease all take a toll of the wheat crop, and the provision of a suitable crop to grow in rotation with wheat is not an easy task. Oats, however, fit in well to the wheat rotation; they are more early maturing than wheat and can often be expected to produce a satisfactory crop on less fertile soils or less carefully prepared land. The use of oats for headlands and buffers assures a supply of oaten hay for the horses, which is of value in controlling flag smut. This disease can be spread by the dung of horses fed on infected wheaten hay. Again, in marginal areas, early varieties of oats have generally been shown to yield better than wheat. Oats are more resistant to disease than wheat.

The correct stage for cutting oats is when the grain is fully formed and the most mature grains, usually located at the top of the panicle, are commencing to harden. At this stage, the straw is commencing to show colour. The harvesting of oats is delayed to this stage because of the trade preference for a large percentage of grain in oaten hay, and the better flavour of more mature crops to stock.

Oats are cut with the reaper and binder, and generally dealt with in a similar manner to a wheaten hay crop. A purplish-green colour of the chaff prepared from oaten hay cut in the late dough stage is taken by buyers as an indication that harvesting was carried out before the seed



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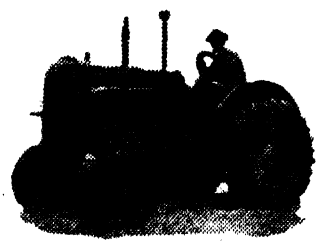

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became "dead ripe," at which stage there is a risk of excessive shattering.

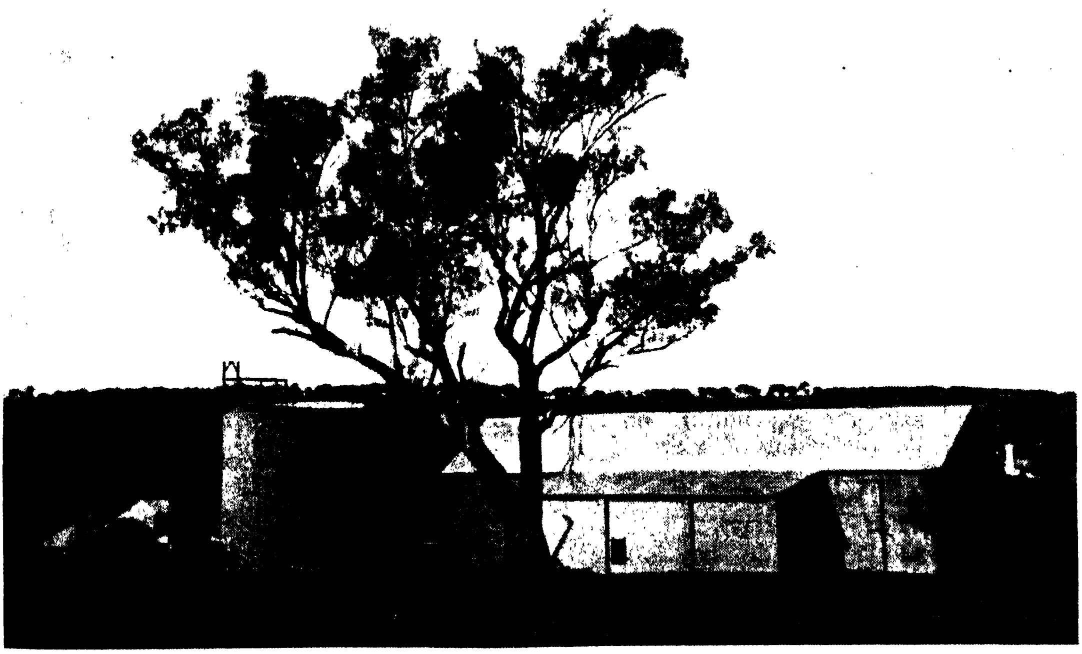
The rates of seeding per acre are higher than for wheat, 60 to 80 lb. per acre being used, the higher rate mainly under coastal conditions or when it is intended to graze the crop heavily. The use of superphosphate in those districts where it produces a response in the wheat crop is also recommended for oats. It should be applied at about the same rates as for a wheat crop grown for grain or hay, that is 56 to 112 lb. per acre, depending upon locality and weather and other conditions.

a better understanding of the scientific principles of stock feeding.

Oaten chaff is considered to be the most nutritious of the cereal chaffs, and this, to a certain extent, is due to the grain present in the sample. It generally contains slightly more protein and fat than other cereal chaffs, and is sweeter and more palatable. Although chaff is generally used to supply the "bulk" of a ration, prime oaten chaff is relatively rich in protein.

Oaten Straw.

Good oaten straw has considerable value as a drought fodder, particularly if it can



A Concrete Hay Shed that Contains Separate Compartments for Grain, Chaff, Etc.

be supplemented by a little green feed or silage. The soft and pliable stems are more palatable than other straws and superior to barley and wheat straws in feeding value. In drought-stricken areas, the feeding of this straw damped with a little molasses and water provides a feed which has been found suitable for all stock.

Grazing reduces the total yield of hay cut, but under good conditions, varieties such as Algerian may give one or two grazings and still yield a sizable crop of hay.

There is a good demand for oaten hay and chaff on the Sydney market, and although the demand for the Metropolitan delivery trade is on the wane, the demand from graziers and fat stock growers in inland districts is increasing, coinciding with

The digestion of straw by horses and cattle provides energy for the maintenance of bodily activity so that it can form part

of the ration for dry stock or idle horses when dry feed is scarce. The principal deficiencies of straw as a feed for this purpose are a lack of vitamin A content (which could be guarded against by the feeding of lucerne or other legume material), and its dustiness. The presence of rust or mustiness in straw is also undesirable.

The Use of Salt with Cereal Products.

On a few farms straw stacks are made for reserve fodder, and although the time and labour expended on this material might be better spent in the production of a hay crop of higher feeding value, such a stack is a handy standby in dry times if there is nothing better offering. Straw is improved in palatability if about 6 lb. of coarse salt to the ton of straw is spread evenly in layers over it as the stack is built up. Molasses or water should not be added during stacking as they may encourage mould growth.

In the drought feeding of sheep, salt is sometimes mixed with the chaff ration in self-feeders or troughs, the object being to make the stock eat the available food at a slower rate, permitting of economy of feed and labour for distributing it. The salt in this case adds nothing to the feed value or palatability of the ration, and probably makes the stock thirstier, which is no advantage. It would be far better to conserve adequate stocks of fodder against drought periods and save the expenditure on salt which is, from the point of view of its feeding value, wasted.

Mixed Oaten Hays.

In other States a "shandy" hay is sometimes grown—comprising a mixture of wheat and oats—but for New South Wales conditions little advantage appears to be derived from this practice.

However, from the point of view of soil fertility and nutrient value of the resultant product there are many factors in favour of a hay produced by sowing a legume with oats or other cereal for hay production, under conditions of good rainfall in the growing period. Particularly on the coast the sowing of field peas or vetches with the hay crop deserves to be more popular, as the yield of hay produced under these conditions has been shown experimentally to be increased and its nutritive value enhanced, while the difficulties of curing are no greater than with ordinary hay. One of the main factors preventing this practice becoming popular is probably the high price of field pea and vetch seed. Between 20 and 30 lb. of field pea or vetch seed should be sown per acre together with 40 to 60 lb. of oat grain.

Another useful practice which is strongly recommended, particularly in the New England District, is the sowing of about 5 lb. to the acre of Red clover seed with the oat crop. If reasonable rainfall is obtained during the latter part of the growing period, a good strike of Red clover is obtained, which provides excellent aftermath to the hay crop for spring grazing.

Barley Hay.

The growing of barley for hay is not recommended, owing to the long awns produced on the seed head. It is much better to cut the crop for silage or harvest and feed the grain.

Rye Hay.

Rye has a limited value for hay and is grown, mainly on the coast, for this purpose, but more commonly it is cut for green feed. When used for hay it should be cut at the early flowering stage as it rapidly becomes fibrous throughout the stem after flowering. Rye also lends itself to sowing with a leguminous crop. Superphosphate at 56 lb. to 112 lb. per acre should be used, except on the North-western slopes.

Rye also does well on poor or "cold" soils, which other cereals do not, and it has found a use in the southern States on poor mallee country to control erosion and provide fodder.

Japanese Millet Hay.

Japanese millet is the only summer growing cereal in this State generally cut for hay. It is useful because it is a quick growing crop and advantage can be taken of summer rains to produce a quantity of material of good feeding value. Seed is usually sown at 12 lb. to 20 lb. to the acre and the addition of superphosphate is advantageous. Although normally cut for silage, Japanese millet provides a hay of fair feeding value, although rather coarse, which can be fed without danger to cattle or sheep. There is a danger in feeding it

(*Continued on page* 486.)

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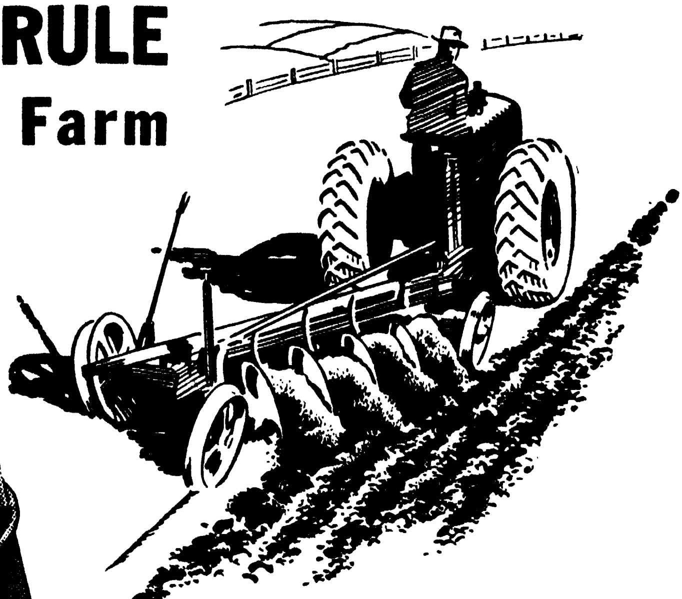

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WEEDS IN SPORTS AREAS.

Their Prevention and Control.

(*Concluded from page* 426.)

A. PEARSON, H.D.A., Weeds Officer.

THE control of weeds by the application of chemical substances has been greatly developed in recent years, and much research is being conducted with substances known as selective weedicides. These chemicals are discussed in this concluding section of this article, which also lists the treatments recommended for the control of the weeds commonly found in sports areas.

The article commenced in July issue.

Control by Chemical Means—*continued*.

Dinoc (Sodium-dinitro-ortho-cresylate).

This is one of the newer selective type weedicides. It is marketed specially for use on lawn areas. The dried product is highly inflammable and it is therefore important that all equipment should be washed after use. This weedicide is applied at a concentration of 1 per cent. for small seedling weeds and 3 per cent. for more mature plants. Experience has shown that the application of 1 lb. of sulphate of ammonia as an activator to each 100 gallons of spray mixture improves the efficiency of the spray.

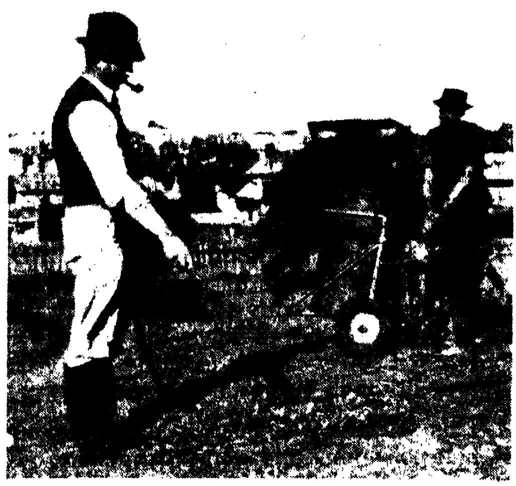
While Dinoc has been in common use for only a comparatively short period, it has been shown to be very suitable for the control of certain types of common weeds found on golf courses and lawn areas.

Hormone Type Selective Weedicide.

Hormones are, of course, growth-promoting substances. They are now being used fairly extensively for this purpose. During the war years while research was being conducted into their use, it was accidentally discovered that when used at stronger concentrations they caused the death of plants instead of encouraging their propagation. From this discovery, English and American scientists developed two groups of weedicides. The English group is marketed under the trade name of Methoxone, while the American group, which is commonly known as 2, 4-D is sold under many different names in its country of origin.

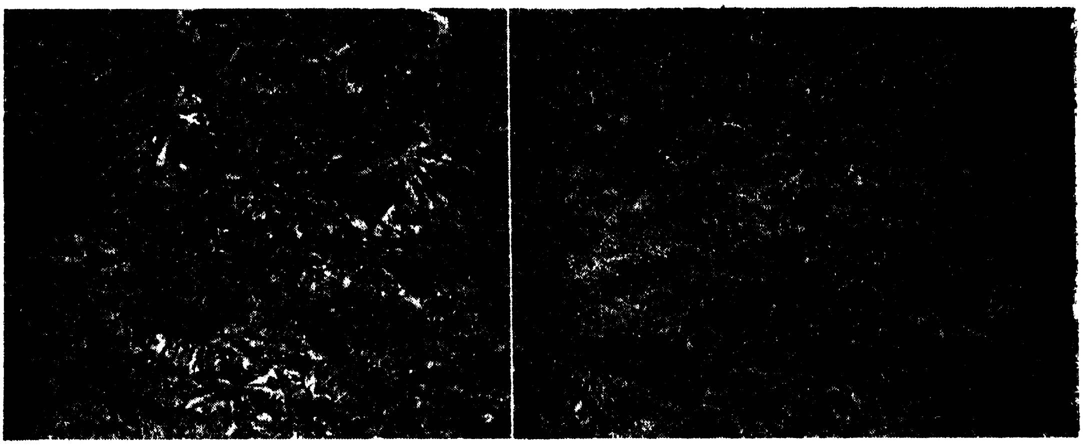
Methoxone. (Sodium 4, Chloro 2, Methyl phenoxyacetate).—The only trade preparation of this weedicide on the market in New South Wales contains a 10 per cent. concentration of the active principle. The spray is non-poisonous and non-inflammable, and the normal strength of application is as a 0.1 per cent. solution of the active ingredient. This is obtained by mixing 1 gallon of the material as purchased with 100 gallons of water, or for small quantities 3 1/5 ozs. to 2 gallons of water.

The spray should be applied in as fine a form as possible in sufficient quantity to wet all the area to be treated. In effect this means using from 100 to 150 gallons per acre or from 1 to 1½ gallons for each 50 square yards, depending upon the efficiency of the spray equipment. For more persistent weeds the spray should be applied at double strength.



Suitable Type of Spray Pump for Use in Controlling Weeds in Sports Areas.

In general terms Methoxone has no effect upon any member of the grass family. It can, therefore, be used for spraying whole



Lawn Weeds (mostly Dandelion), Killed by the use of a Selective Weedicide.

lawn areas with the knowledge that it will not damage the lawn grasses. Methoxone has been shown to give the best results when the plants to be killed are in a vigorous state of growth. Experience has shown that under cool weather conditions it is much slower in action than under hot conditions. During the winter months it may take several weeks to kill a weed which would succumb to the effects of the spray in a few days during the summer.

2, *4D* (2, 4 Dichlorophenoxyacetic acid).—This is usually marketed in the form of the sodium salt of the acid. At the present time in New South Wales there is only one preparation on the market and this is being sold under the trade name of 2, 4 Diweed, which contains a 70 per cent. concentration. This material is on sale in powder form. The normal strength of application is as a 0.1 per cent. solution of the active principle. This is obtained by mixing 1 lb. of 2, 4 Diweed with 70 gallons of water or for small quantities ½ oz. with 17½ pints of water. It is advisable to dissolve the powder as purchased in a small quantity of warm water, although this is not essential.

This selective weedicide, like Methoxone, is non-poisonous and non-inflammable. Its reaction on plants is similar to that of Methoxone, and like that spray it acts much more quickly during hot weather than during cold weather. It should be applied in as fine a form as possible in sufficient quantity to wet all of the foliage, but not sufficient to cause appreciable run-off. This will usually take from 100 to 150 gallons per acre or from 1 to 1½ gallons for each 50 square yards. With the more persistent type of weeds it should be applied at double strength. Like Methoxone, the 2, 4-D preparations have little or no effect upon members of the grass family.

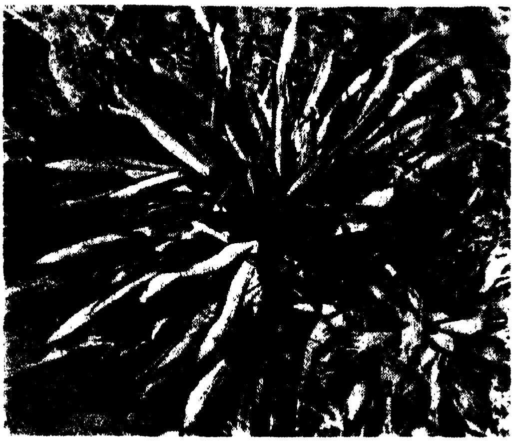
Methoxone and 2, 4-D are new sprays and experimental work is still proceeding with them. Much has yet to be learnt about their use as some conflicting results have been obtained. It has been stated that they have little or no effect upon members of the grass family, but some instances are known where grasses have been severely damaged by the applications of these sprays. In each instance, however, where grasses have been damaged, the spray has been applied to lawn areas which have been in the shade for the greater part of the day. No instance is known of grasses being affected when the sprays have been applied at the recommended rates of application and the treated area has been in ordinary sunlight.

Treatment of Individual Weeds.

Paspalum (*Paspalum dilatatum*).—Where this plant appears as a weed on greens, the individual plants should be pulled out when they are still small. On fairways, football grounds, etc., a kill in excess of 90 per cent. of old established plants can be obtained by spraying with Atlacide or sodium chlorate, mixed at the rate of 2 lb. to 3 gallons of water, plus a wetting agent. The application of sodium chlorate at this strength will severely damage couch grass, but provided only sufficient spray is applied to wet the foliage of the paspalum,

the couch grass will recover. Recovery, of course, would be assisted by the application of sulphate of ammonia as a fertilizer.

Parramatta Grass (*Sporobolus capensis*).—Should be treated in a similar manner to paspalum.



Unsprayed Lamb's Tongue Plant.

Caltrops (*Tribulus terrestris*).—May be killed by spraying with 2, 4-Diweed or Methoxone at a concentration of 0.1 per cent. of the active principle.

Water Couch (*Paspalum distichum*).—Should be treated in a similar manner to paspalum.

Mullumbimby Couch (*Kyllinga monocephala*).—This plant is very difficult to remove from greens, and the usual method is to pull out the individual plants or to cut them out with a chisel. Some greenkeepers have had successful results by burning off with sulphate of ammonia.

Cyperus gracilis.—No information is available regarding chemical spray treatment for this weed. Individual plants should be cut out with a chisel.

Nut Grass (*Cyperus rotundus*).—Experimental work is still proceeding with this weed, and at the present time no definite recommendation can be made. Overseas reports indicate that very possibly a spray will be created for this weed, as experimental work has shown that the Methyl ester of 2, 4-d in kerosene has proved satisfactory. In some recent work carried out in this State, a good kill was obtained with a very heavy infestation of nut grass by using Methoxone or 2, 4-D at the normal rate of application with the addition of 1 oz. of a wetting agent to each gallon of spray. In another case a good kill was obtained in a garden area by making a very heavy application of Methoxone. In this case the Methoxone was applied at a rate which equalled 30 lb. of the active principle per acre.

Wild Onion (*Nothoscordum fragrans.*)—This weed cannot be killed with known spray methods. On well-kept greens or lawns it will die out with frequent mowing. On other areas the only treatment that can be suggested is to endeavour to dig the plant out. Best results from digging will be obtained if the operation takes place when the young bulbs are clinging tightly to the parent plants. This is usually between June and September.

Lamb's Tongue Plant, Ten Days After Spraying with Hormone Type Weed Killer.

Common Cotula or Bachelor's Button (*Cotula australis*).—This weed can be treated with arsenic, and while no experimental work has been done, it is thought that it could be killed with either Methoxone or 2, 4-D at a 0.1 per cent. concentration.

Dandelion (*Taraxacum officinale*).—This weed can be eradicated by spraying infested areas with either Methoxone or 2, 4-D at a concentration of 0.1 per cent.

Flatweed or Cat's-ear (*Hypochaeris radicata*). — The application of either Methoxone or 2, 4-D at a concentration of 0.1 per cent. will prove satisfactory for the treatment of this weed.

Cudweed (*Gnaphalium purpureum*).—This weed may be killed with an arsenical spray or with Methoxone or 2, 4-D at a 0.1 per cent. concentration.

Procumbent Pearl-wort (*Sagina procumbens*).—Definite information is not available, but it is thought that either Methoxone or 2, 4-D, at a concentration of 0.1 per cent. will kill this weed.

Lamb's Tongue or Rib Grass (*Plantago lanceolata*).—The application of either Methoxone or 2, 4-D at a concentration of 0.1 per cent. will kill this plant.

Small Plaintain (*Plantago varia*).—This weed should be sprayed with Methoxone or 2, 4-D at a concentration of 0.1 per cent.

Milky Lobelia (*Lobelia concolor*).—Definite evidence is not available, but it is thought that either 2, 4-D or Methoxone will prove satisfactory for the eradication of this plant. It should be applied at a concentration of 0.1 per cent.

Pennywort, Water Weed or Duck Weed (*Hydrocotyle* sp.).—This weed can be treated quite effectively by the application of either 2, 4-D or Methoxone at a concentration of 0.1 per cent.

Kidney Weed (*Dichondra repens*).—Either Methoxone or 2, 4-D at a concentration of 0.1 per cent. is satisfactory for the treatment of this plant, although generally two applications are necessary.

Red-flowered Mallow (*Modiola caroliniana*).—This plant is very easily killed by the application of either Methoxone or 2, 4-D at a concentration of 0.1 per cent.

Wireweed (*Polygonum aviculare*).—This annual plant can be killed by the application of a 1 per cent. concentration of Dinoc when the plant is in the small seedling stage. With older growths, satisfactory results can be obtained with heavier concentrations.

Chilian Whitlow (*Paronychia brasiliana*).—May be killed by spraying with either 2, 4-D or Methoxone at a concentration of 0.1 per cent.

Petty Spurge (*Euphorbia peplus*).—Is very easily killed with either Methoxone or 2, 4-D at a concentration of 0.1 per cent.

Caustic Weed (*Euphorbia drummondii*).—May be killed by the application of either Methoxone or 2, 4-D at a concentration of 0.1 per cent., but it is usually slower in dying than Petty Spurge.

Cape Weed (*Cryptostemma calendulaceum*).—May be killed by spraying with Dinoc mixed with a concentration of 1 gallon to 30 gallons of water.

Moss.—May be killed by spraying with 5 lb. of sulphate of iron to 10 gallons of water.

Milk Thistle (*Sonchus oleraceus*).—May be killed with Dinoc at a 1 per cent. concentration or with Methoxone or 2, 4-D at a 0.1 per cent. concentration.

Clover and Trefoils.—Can be treated with Methoxone or 2, 4-D at a 0.1 per cent. concentration, with Dinoc at a 1 per cent. concentration or with sulphate of ammonia.

Yellow Wood Sorrel or Sour Grass (*Oxalis corniculata*).—No known spray will completely kill out this weed. The top growth can be removed by spraying with arsenic pentoxide at a concentration of 1 lb. to 16 gallons of water.

A Patch of Lamb's Tongue, Three Weeks after Spraying with Hormone Type Weed Killer.

THE CITRUS BUD MITE

(*Aceria sheldoni* Ewing)

P. C. HELY, B.Sc.Agr., H.D.A., Entomologist.

THE citrus bud mite occurs throughout the citrus growing areas of the State and has proved an important pest, especially of Navel oranges and lemons, in coastal orchards. In addition to the production of distorted twig growth which may seriously restrict the development of the tree, deformed fruits of reduced market value cause considerable losses to lemon growers. Severe infestation of Valencia oranges is uncommon.

The citrus bud mite was described by Ewing[5] in 1937, following the discovery of this pest in lemon trees near Santa Paula, California, in June of that year. An account of the circumstances attending this discovery, together with a description of the injury caused by the mite, was given by Boyce and Maxwell[2], in the *California Citrograph,* early in 1938.

Similar mites were later discovered at Gosford and in the Hills district of New South Wales, associated with a type of injury described by Boyce and Maxwell. This injury had been previously observed on citrus trees over a considerable period. A brief report of this discovery, together with some notes on the habits and distribution of the pest was published in 1939[6].

A comprehensive account of the history, economics, distribution and control of the citrus bud mite, which included also Keifer's[7] description and illustrations, was given by Boyce and Korsmeier[3] in 1941. This account also included observations supplied by the writer (P.C.H.) on the behaviour, importance, and control of this species in New South Wales.

Whilst on a visit to Queensland in August, 1939, typical bud mite injury was recognized on citrus varieties, and subsequently specimens of Eriophyid mites were found in citrus bud material supplied by N. E. H. Caldwell, of the Queensland Department of Agriculture and Stock. These specimens, together with the New South Wales mites, were later identified by H. H. Keifer, of the California State Department of Agriculture as a variety of *Eriophyes sheldoni.* A short account[1] of this mite as a pest of citrus in Queensland appeared in 1941, and more recently a somewhat fuller review of the position has been given by Caldwell[4].

Distribution.

In this State, citrus bud mite has been observed commonly on citrus trees in practically all the leading citrus areas, and extends from the North Coast to the inland groves of the Murrumbidgee Irrigation

Fig. 1.—Photomicrograph of Bud Mites (X150).
[*Photo: A. M. Boyce.*

Area. In Queensland the distribution, according to Caldwell, is similarly very extensive, and though there appears to be no published record from the other States, it is highly probable that this mite occurs wherever citrus trees are grown.

Hosts.

Although a widespread and cosmopolitan citrus inhabitant, the importance of the citrus bud mite varies considerably, and in different areas there is great variation in the extent of the damage caused on different citrus hosts. According to Boyce and Korsmeier the lemon is by far the most important host in California, though the Valencia orange is apparently becoming increasingly infested.

Under Central Coastal conditions in New South Wales, bud mite is of importance chiefly on Navels and lemons, and to a small extent on grapefruit and Silettas. Valencias rarely show appreciable injury. In the Murrumbidgee Irrigation Area, lemons appear to be the only trees heavily infested, and blocks of Navels showing only traces of injury have been seen adjacent to heavily infested lemons.

Lemons are the most generally affected, and Californian experience indicates that the Eureka variety is more subject to injury than is the Lisbon. Navels may be heavily infested and gross injury is common on this variety. Mandarins are not commonly affected, but Caldwell states that, in Queensland, severe injury may occur on certain mandarin varieties.

Method of Distribution.

Mites may be found and injury may commonly be observed in budded nursery stock, and sometimes also on seedlings in the nursery, and there is little doubt that the dissemination of the mites is very largely brought about through the distribution of infested nursery trees. Twig grafts used for re-working old trees to other varieties have been seen to show severe bud mite injury, whereas growth from the original stocks was quite normal.

Mites are also doubtless spread from place to place by various active insects which frequent citrus trees, and possibly birds also aid in their dissemination. Boyce and Korsmeier cite wind as a factor in local distribution and state that bud mites have been collected on glass plates coated with a sticky substance, placed near infested plants.

As it is not the habit of bud mites to remain for more than very brief periods in exposed situations and they are rarely to be observed moving freely in the open, the opportunity for such spread by wind and insects must be very limited, and transmission within the buds to newly worked stock is no doubt the principal means of spread.

Nature of Injury.

Citrus bud mites are almost always associated with the most tender and succulent tissues of the plant, and, consequently are almost wholly confined to the soft tissue within the leaf axil buds, or to the expanding young shoot as it bursts from the bud. They occur also within the flower buds, beneath the calyx lobes of the fruit, and sometimes where two young fruits are in close contact.

Mites are usually most abundant within the leaf axil buds on the more recent shoot growth, well within such buds, or between the bud and the shoot or the leaf stalk where these press tightly against the outside of the bud. On the older wood mites are much more difficult to find, as the buds on such wood are usually much less plump, and here the mites penetrate more deeply into the centre of the buds.

It is common to find up to about a dozen mites in individual buds on infested trees, but where infestation is heavy some buds may show a much greater number.

The effect of these mites feeding on the young tissue of the bud is very soon evident as the feeding sites show as jet black areas. Frequently the bud scales are completely blackened and the entire bud may be destroyed. Around the bases of such injured buds, small adventitious buds develop, which may in their turn be damaged, or in any case produce only weak spindly shoots.

Growth developing from infested buds may be variously affected; the shoots may be thin and spindly or may be flattened, twisted and contorted in different ways. Such distortion of shoot growth is usually most pronounced on young or very vigorous trees. Leaves developing on such shoots are also distorted and irregular in shape, often

being deeply constricted at the middle or showing a deep indentation at the apex. Small cupped or "mouse ear" shaped leaves are also common, especially towards the base of the shoot.

Fig. 2.—Lemon Twig showing Typical Bunched Appearance of Leaves due to Mite Attack.

[*Photo: A. M. Boyce.*

Probably the most characteristic feature of bud mite infestation, and one that can be taken as specific in determining the condition, is the very typical rosetting of the leaves at the apex of the shoots. This rosetting is probably due to the concentration of mites at the tip of the shoot as it lengthens from the bud and consists of from 3-5 leaves, often variously deformed, arising from almost the same point at the tip of the shoot.

Where shoot contortion and rosetting is extensive, combined with the development of numbers of adventitious shoots, the affected tree presents a very typical bunched appearance, and this appearance is characteristic of otherwise healthy vigorous trees when bud mite infestation is severe. On less vigorous trees, the production of weak, spindly twigs, from multiple adventitious buds is the more characteristic appearance.

Deformity of the flowers is a common symptom of bud mite injury on lemon, and this occurs also on oranges. With the former variety, at least, many such deformed flowers will successfully set, but the fruits assume unusual and sometimes extremely grotesque shapes.

The injury caused by the mites feeding beneath the calyx lobes of lemons or between fruits in contact, consists simply in the production of jet black discolouration of the surface tissue on which the mites have grazed, and is of no commercial importance.

Life History and Seasonal Development.

The adult mites are extremely small, approximately 1-200 inch in length, more or less sausage-shaped, and are cream or pearly white in colour. Individual mites are too small to be seen without the aid of a microscope.

The eggs are globular, relatively large compared with the size of the mites, and are glistening white. They are deposited singly on the tender tissues on which the mites are feeding, and have been found most abundantly during the late winter and spring, though they may be found at any time during the year.

No data are available here for the developmental periods of the different stages, but Boyce and Korsmeier state that under Californian summer and autumn conditions development from egg to adult could occur

Fig. 3.—Lemons with Calyx and Lobes Turned Back.
Left.—Showing discolouration caused by mite beneath calyx lobes.
Right.—Clean fruit.

[*Photo: A. M. Boyce.*

in from 10 to 15 days, and that under laboratory conditions adults survived for 31 days on the host and for 4 days on glass slides without food.

Living as they do in such protected situations, it would seem unlikely that extremes of weather would affect these mites to any

great extent. However, very considerable mortality may occur under conditions of high temperatures and low humidities. During January, 1939, severe heat-wave conditions caused an almost complete disappearance of bud mites and eggs in the Gosford district, and only after several normal seasons did the populations build up to their previous numbers. It was interesting to note that shade temperatures of up to 112 deg.

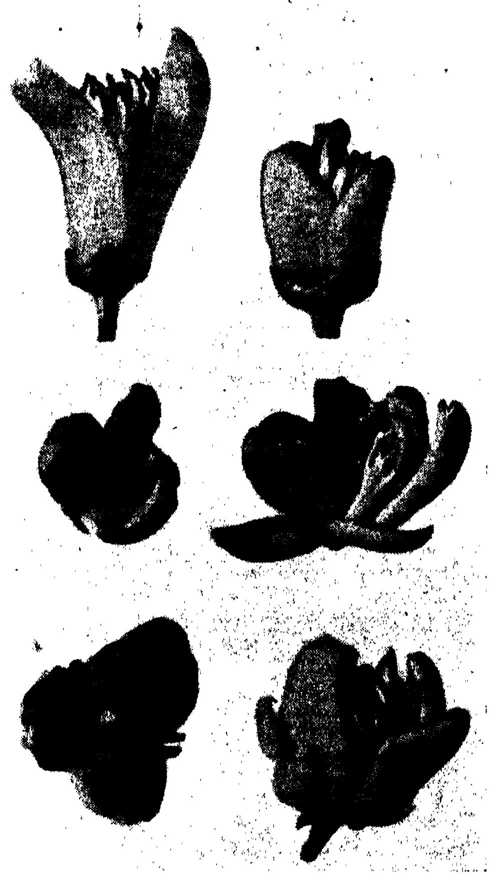


Fig. 4.—Lemon Flowers showing Varying Degrees of Deformity due to Mite Attack.
[*Photo: A. M. Boyce.*

Fahr. did not appear to affect the mites adversely, but a following day when the temperature rose to 118 deg. Fahr. with a corresponding drop in humidity, an almost complete mortality of mites and eggs occurred. The extent of the destruction was such that 12 months later no mites or mite damaged buds could be found on wood which had developed since that time, on trees, which were known to have been previously heavily infested.

It was also noted at that time that citrus rust Mites, *Phyllocoptruta oleivorus* (Ashm.), although living in the most exposed situations on the trees, did not appear to be affected.

Comparison of Citrus Bud Mite Injury with Other Common Citrus Troubles.

A certain amount of confusion exists in the minds of many growers in regard to the condition brought about by bud mite injury and that caused by certain minor element, especially copper and zinc, deficiency troubles.

On non-vigorous trees which have suffered from bud mite injury and on which multiple budding has been induced by the continual blasting of the buds by mites, an abundant production of short, weak twigs occurs, often bearing small, narrow leaves. This condition may be difficult to distinguish from that caused by some minor element deficiency. On young vigorous trees the bunched growth condition may be reminiscent of exanthema or copper deficiency and some confusion of symptoms may arise.

In the positive identification of bud mite injury in the field, certain characteristic symptoms may, however, be depended upon to identify this condition from any other trouble. Some of these symptoms are set out below:

(1) Rosetting of the leaves at the tips of some of the twigs.
(2) Production of leaves showing variations in shape, especially irregular margins.
(3) Contortion of the shoots.
(4) Deformity in flowers and fruits, especially on lemons.

In addition to the above characteristics, bud mite infestation causes no colour patterns in the leaves, and the foliage, fruits and flowers are normal in colour and texture. No gum staining occurs, nor is there any leaf-fall associated with this condition. Die-back of twigs is not a symptom of bud mite injury, though some die-back of small adventitious twigs may eventually result from crowding.

Control.

Sulphur-containing materials show considerable toxicity to bud mites, and these materials have proved the most satisfactory

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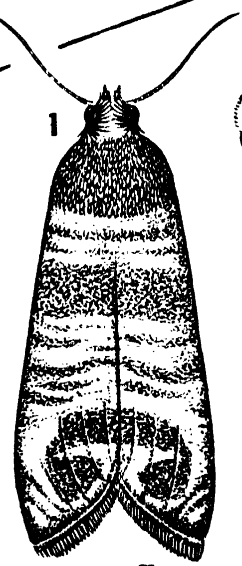

Codling Moth

1. Coding Moth greatly magnified.
2. Codling Moth, actual size, and opened calyx of fruit which permits entry of the grub.

SPRAY CALENDAR . . . September

Codling Moth. Spray calyx with Neptune Arsenate of Lead.
Green Peach and Black Peach Aphid, and Black Cherry Aphid. Spray with Neptune Black Leaf 40 plus Neptune White Spraying Oil. Or as an alternative, use Neptune D.D.T. Spraying Emulsion.
Freckle and Brown Rot. Spray with Neptune Lime Sulphur.

CITRUS

Aphid. Spray with Neptune Black Leaf 40 combined with Neptune Lime Sulphur plus Neptune Casein Spreader.
Bronzy Citrus Bug. Use Neptune D.D.T. Spraying Emulsion.

Prepare for summer spraying by ordering now, from your Neptune Agent, your requirements of the following sprays:—

NEPTUNE WHITE SPRAYING OIL
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for control in this State. Oil sprays also give a definite measure of control but are less permanent in their effects than the sulphur compounds. Hydrocyanic acid gas fumigation, as practised for the control of scale insects in some citrus districts, does not appear to provide effective control. Some limited experiments with D.D.T. emulsion have shown[7] this material to be less effective than lime-sulphur or the standard white oil spray.

The following table shows the results of a randomized block experiment conducted on heavily-infested Navel orange trees sprayed at different times during the winter and spring with white oil or lime-sulphur at different concentrations. Random samples of spring growth shoots were taken during the following January and the percentage of leaf axil buds showing evidence of bud mite injury was determined.

From then on until mid-January the percentage of marked buds on unsprayed trees increased by a further 25 per cent. The intensity of marking and the severity of injury was, however, considerably greater by January than it was in November.

Whilst a satisfactory kill of mites appears to be possible at any time of the year, best results have been obtained by winter treatment. Sulphur compounds may be used at this time of the year with little risk of injury and effective control at this period allows normal shoot development and blossoming to occur in the spring. If the initial infestation is heavy some build-up of mites and injury to the autumn growth may occur later in the season, but this is greatly minimized where routine oil sprays are applied during the summer for control of scale insects.

Lime-sulphur spraying of the trunk and main limbs is the normal practice during the winter in coastal orchards for the control of white louse scale (*Prontaspis citri*), and a more complete cover which would include the foliage wall as well as the inside framework of the trees, offers a satisfactory means of controlling bud mite.

Citrus Bud Mite Spraying Experiment.

Date Sprayed.	Material.	Percentage of Normal Buds.	Remarks.
April ...	Lime-sulphur 1 in 40 ...	96.7	Shoots normal. Injury slight. Live mites in marked buds.
April ...	White oil 1 in 40 ...	94.3	Shoots normal. Some buds severely injured. Live mites
June ...	Lime-sulphur 1 in 15 ...	99.7	Shoots normal. Bud injury very slight.
July ...	Lime-sulphur 1 in 15 ...	98.4	Shoots normal. Bud injury very slight.
November ...	Lime-sulphur 1 in 50 ...	52.7	Some rosetting of shoots. Some buds severely marked. Odd bud mites
June and November ...	Lime-sulphur 1 in 15 ... Lime-sulphur 1 in 50 ...	100	Shoots normal.
July and November ...	Lime-sulphur 1 in 15 ... Lime-sulphur 1 in 50 ...	100	Shoots normal.
April and November ...	Lime-sulphur 1 in 40 ... Lime-sulphur 1 in 50 ...	99.0	Shoots normal.
April and November ...	White oil 1 in 40 ... Lime-sulphur 1 in 50 ...	100	Shoots normal.
Untreated		27.95	Rosetting, multiple budding, some shoot contortion, some buds very severely injured. Live mites plentiful.

It will be noted from the above table that between the time when shoot growth commenced (late July) and the date of spraying in mid-November, approximately 47 per cent. of the buds were marked by mites.

Lime-sulphur concentrate with a polysulphide sulphur content of about 20 per cent., diluted at the rate of 3 gallons to 40 gallons with the addition of ½ lb. casein-lime spreader to each 40 gallons of spray may be used with reasonable safety over the whole of the tree during June and July, and can be expected adequately to control both white louse scale and citrus bud mite. Where Bordeaux sprays have previously been used during the same season, such an application of lime-sulphur may be followed by more or less heavy leaf-fall. Under such circumstances it may be necessary to confine the strong lime-sulphur spray to the insides of the trees to control white louse scale and to spray the foliage with a lower concentration, say 1 in 40, to control bud mite.

In many cases the position arises where it is desired to control snails, brown rot or perhaps exanthema, with Bordeaux mixture in the late autumn, and to follow later with a lime-sulphur spray in winter for bud mite. If white louse scale does not require to be considered in such a situation, a suitable and effective combination of colloidal sulphur with the Bordeaux mixture may be used. The following spray has proved effective under such circumstances:

1 lb. Colloidal sulphur and ½ lb. casein-lime spreader, added to 40 gallons of 2:2:80 Bordeaux mixture.

During recent years a system of "skeleton pruning" developed largely by Mr. Roy Wood, formerly Fruit Inspector in the Department of Agriculture, has been increasingly practised in coastal orchards for the rejuvenation of orange and lemon trees which have reached a condition of growth stagnation. This pruning involves the removal of all twig and foliage growth, and the limbs are cut back to wood of a minimum diameter of about ½ inch. Such pruning removes the very great bulk of the tissue in which bud mites develop, and this pruning alone is often followed by normal shoot growth, even on heavily bud mite infested trees. On such pruned trees, however, some mite development may occur on the first shoot growth, doubtless from mites which have been present in buds on the old wood. A thorough spraying with lime-sulphur after pruning, therefore, offers an excellent opportunity to establish control of bud mite and also white louse scale under the best possible conditions.

Summary.

The citrus bud mite (*Aceria sheldoni*), first identified as causing injury on lemons in California in 1937, was later found associated with a similar type of injury to citrus in New South Wales and Queensland.

The distribution of this mite in both New South Wales and Queensland has been shown to be widespread, and the pest occurs in all the principal citrus-growing regions.

All the common citrus varieties are attacked, but lemons in the inland areas, and lemons and Navels on the coast, are the principal varieties showing serious injury.

Distribution of the mites is largely related to the distribution of budded nursery trees—and buds and twig grafts used in reworking trees to other varieties, offer a ready means of initiating infestation. Californian experience indicates that mites may be spread locally by wind and probably by the agency of insects and birds visiting citrus trees.

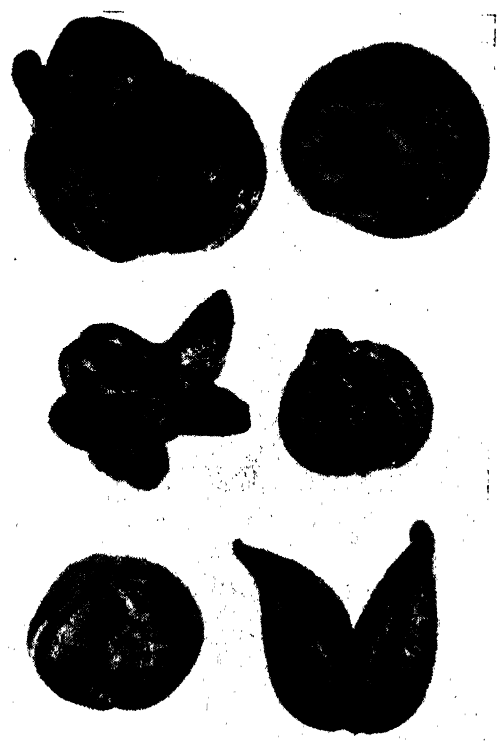


Fig. 5.—Young Lemons showing Deformities due to Attack by Bud Mites.

[Photo: A. M. Boyce.

(Continued on page 504.)

INSECT PESTS.

Notes contributed by the Entomological branch.

The Furniture Beetle (*Anobium punctatum*).

THE adults of this borer begin to emerge from infested timber about the end of September, and the emergence of adults may continue until January or even later. The beetles usually come out at night, and at this time may be found crawling on the outside of infested wood or wandering nearby. In darkened, or ill-lighted rooms, however, they may emerge during the day.

Usually, the first indications that timber is infested are the small circular exit holes or flight holes of the adults, and accumulations of wood-powder or dust which falls from them. Timber that is known to have been infested the previous season should be carefully watched for the presence of any new holes or dust beneath.

These beetles commonly infest shelving, flooring and household furniture constructed with pine timbers, and also portions of more costly articles, where pine has been used, such as in pianos, etc. They may also infest some of the harder woods, such as beech, willow, maple, etc. They are never found attacking local hardwood timbers.

The adult, which may measure from about one-tenth to one-fifth inch in length, is a dark-brown beetle and the thorax overhangs the head like a hood. These beetles are capable of flying, and in infested rooms are, at times, found in numbers on window ledges.

Life History.

Egg-laying begins a few days after mating and the eggs are deposited in cracks, pores or holes in the wood, or on the rough-cut ends of sawn timber, or in the tunnels from which beetles have emerged.

The eggs hatch and the minute grubs bore into the wood, where they remain feeding and tunnelling through the timber for about ten months or even longer. There is no readily visible sign of where a young "borer" has entered the wood. The tunnels are irregular in direction, and the powdery excretion, which is not tightly packed within them, is coarse grained.

The body of the larva or grub is whitish, and bears a double row of small transverse brown spines on the upper surface of the third thoracic, and on the seven following abdominal segments. It has three pairs of small thoracic legs, all of which are of about the same size, and a yellowish head.

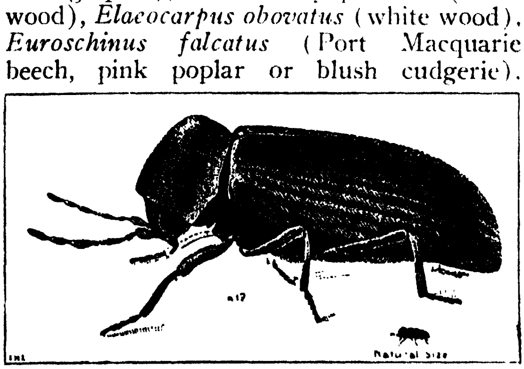
When fully-fed the grub enters its pupal or chrysalis stage within the end of a tunnel, close to the surface of the wood. About three weeks later it becomes an adult and gnaws its way out through the wood, leaving the conspicuous emergence holes and powder beneath. There is evidence that the life-cycle may last three years.

Timbers Infested.

The furniture beetle has been recorded infesting the following Australian and exotic timbers:—

AUSTRALIAN TIMBERS.

Acacia melanoxylon (blackwood), *Agathis robusta* (Queensland kauri), *Araucaria Cunninghamii* (hoop, Colonial or Maryborough pine), *Duboisia myoporoides* (corkwood), *Elaeocarpus obovatus* (white wood), *Euroschinus falcatus* (Port Macquarie beech, pink poplar or blush cudgerie).

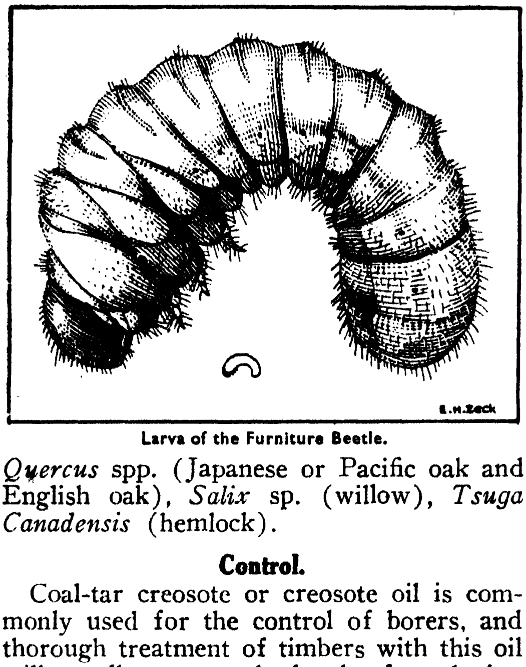


The Furniture Beetle.

Evodia sp. (soapwood), *Olearia argophylla* (musk), *Tieghemopanax elegans* (black pencil cedar), *T. Murrayi* (pencil cedar).

EXOTIC TIMBERS.

Acer saccharum (maple), *Agathis australis* (New Zealand kauri), *Alnus glutinosa* (alder), *Betula verrucosa* (birch), *Fagus* sp. (beech), *Juglans regia* (walnut), *Liriodendron tulipifera* (American tulipwood), *Picea excelsa* (Baltic pine), *Pinus halepensis* (Aleppo pine), *P. radiata* (Californian or insignis pine), *P. laricio* (Corsican pine), *P. strobo* (Weymouth pine), *Podocarpus dacrydioides* (New Zealand white pine)—very susceptible, *Pseudotsuga Douglasii* (oregon)—rare, only in weathered timber,



Larva of the Furniture Beetle.

Quercus spp. (Japanese or Pacific oak and English oak), *Salix* sp. (willow), *Tsuga Canadensis* (hemlock).

Control.

Coal-tar creosote or creosote oil is commonly used for the control of borers, and thorough treatment of timbers with this oil will usually prevent the beetles from laying their eggs on, or reinfesting the timber, and will also kill any larvae or pupae it may reach near the surface. The oil should first be applied during the spring months prior to the hatching of the beetles.

Creosote oil produces a dark-brown stain and affects the painting or staining of the wood. The density of the stain may be reduced by mixing the creosote with an equal quantity, or more, of kerosene. This, however, renders the creosote less effective.

Where staining is not desirable, a mixture containing vegetable turpentine (9 fluid oz.) and kerosene (1 fluid oz.), to which may be added paradichlorobenzene (½ oz.); and a solution of paradichlorobenzene (1 oz.) in kerosene (½ pint) are used. Solutions containing orthodichlorobenzene are also used. Mixtures containing equal quantities of turpentine and kerosene are sometimes used for small articles and furniture, where the infestation is of limited extent. These solutions, however, are not as lasting in their effects and more frequent applications are necessary.

Small articles may be treated by brushing on the solution and allowing it to penetrate into the exit holes, or it may be injected into the holes by means of a fine-pointed syringe. If a power syringe is used, sufficient pressure may be exerted to force the mixture deep into the timber and through the tunnels in the wood, and where the infestation of borers is heavy, or has been prolonged, the liquid may be seen percolating through flight holes a considerable distance from the point of injection.

Oils containing pentachlorphenol in solution are now being used in various countries for the control of borers, and these afford more permanent protection against their attacks, whether the timbers are indoors or exposed to the weather.

Light oils containing copper naphthenate, which are bright green in colour, and oils containing zinc naphthenate, which are colourless, have been widely used in Australia, with good results. The zinc naphthenate, however, is not considered to be as effective as the former.

After treatment the flight holes may be filled with a suitably coloured filler, and this will enable any new emergence holes to be detected readily.

Whatever treatment is adopted every effort should be made to obtain the greatest possible degree of penetration. It must be remembered that perseverance and repeated treatments throughout the season may be necessary, as any one treatment with chemicals may not give complete control. Replacement of extensively damaged timber may be preferable to its continuous treatment.

Heat treatment, at a temperature of 175 deg. Fahr. (in the centre of the timber) for one hour, is sometimes feasible, and will kill borers and their eggs, and vacuum fumigation may be recommended for their control in valuable articles or pieces of furniture.

THE YOUNGBERRY AND BOYSENBERRY.

Introduced Berry Fruits of Value.

J. A. BALLANTYNE, Special Fruit Officer.

DURING recent years there have been various berry introductions into New South Wales, but mostly, it is thought, these are of little value and will disappear. Some of these berry varieties—recently sold for fancy prices and under fancy names—will turn out to be nothing better than the noxious blackberry. The Youngberry and Boysenberry, however, are both of sufficient worth to warrant retention, and should find a place, especially with growers with small areas of land and in close proximity to cities or country towns.

The Youngberry is a cross between the Phenomenal and the Mayes dewberry. It is a vigorous grower and bears well. The fruit is large, dark red in colour (but almost black when ripe), and sweeter than the loganberry; it ripens in early December.

The Boysenberry, produced by Rudolph Boysen, California, is considered the best trailing berry now growing in America. It does not appear to be as vigorous as the Youngberry, but bears well. The fruit is very large and dark red, pleasantly tart, and excellent for jams, jellies and flavouring syrups. This berry ripens about two weeks later than the Youngberry.

Both these berries are of the trailing type and require some support in the way of a fence, or if being grown commercially, they should be trained along a wire trellis.

Boysenberries.

Propagation.

Propagation of plants is easy, as not only do they reproduce readily from tip layering, but also from hardwood cuttings. The method commonly used is to cover the end of the canes with a little soil towards the end of summer. The portion covered makes roots from the nodes, and these have usually developed sufficiently for transplanting during the following dormant period. Suckers from established plants are usually readily obtainable, and in fact this is one of the disadvantages of growing these berries—they may sucker too readily and be difficult to control in the field.

Climate.

These trailing berries can be grown satisfactorily in all districts except those of extreme heat or cold. Generally in the cooler climates the plants will produce over a longer period than in the warmer portions of the State. Low-lying situations liable to

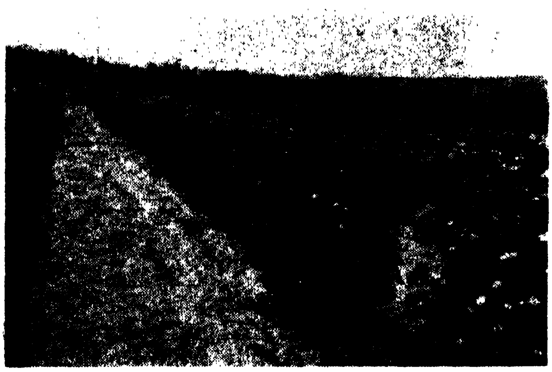
late frosts should, of course, be avoided, as also hillside slopes which may be exposed to strong winds, especially where these occur during spring and early summer.

Soils.

Both berries will grow in a wide range of soils. Provided the soil is reasonably fertile the Youngberry should grow satisfactorily. The Boysenberry is not quite as vigorous and requires better soil conditions. Probably of more importance than the soil are the provision of a satisfactory water supply, and the skill of the grower. Too often these fruits are planted by novices who have actually little interest in them. Berry fruits require similar care to fruit trees, perhaps more, if they are to be grown successfully with maximum production of fruit.

Soil Preparation.

No hard and fast rules govern soil preparation prior to planting. The ground should be well worked and as much weed growth and seed eliminated as possible before planting. If the subsoil is of a heavy nature, it would be advisable to use the subsoiler; otherwise ploughing to a depth of 8-10 inches is recommended.



Youngberries in Blossom.

Berry fruits respond readily to soils containing plenty of organic matter, and the growing and ploughing under of green manure crops before and following planting is recommended. Bulky organic farmyard manures are ideal; the greater the quantity applied the quicker the plants will grow and come into production.

Planting.

The distance between plants and rows will vary, depending on soil fertility, varieties and cultural methods to be followed. It is of importance to ensure that distance between rows is sufficient for tillage implements, and also for the spray outfit which may be required at a later period. Generally, a distance of about 9 feet between the rows is recommended, with the plants spaced in the vicinity of 6 feet apart in the rows; at this spacing about 800 plants should be required per acre.

The young plants should be planted a little deeper than they were in the nursery, and the soil should be firmly packed around the roots.

Pruning.

Following, or prior to planting, it is necessary to remove all the weaker shoots on the young plant, leaving only the strongest cane, which should be cut back to 3 to 6 inches.

Winter pruning twelve months from planting will consist of somewhat similar treatment, as at the planting. During the growing season the plants will have developed new shoots, these coming from around the crown and below ground level and trailing along the ground. These canes, if allowed to remain, will carry fruit the following season. Generally, however, it is inadvisable to attempt to bring the plants into production at this early age, but rather to eliminate weak and superfluous canes completely, and shorten back the strongest one or two canes to about 6 inches. This treatment should ensure production of vigorous and strong canes the next growing season.

The following winter—two years from planting—the young plants will probably have produced quite a few strong canes, and some of these can be taken up to the wire for cropping. The number of canes allowed to crop will depend on the vigour of the plant. Be careful not to leave too many at this stage; usually four canes at the most, on the strongest plants are sufficient, and these canes should be cut back so that they do not extend any great distance along the wire.

As the plants age and develop, so the number of canes can be increased until each plant may be carrying a dozen or so. Once having fruited, the cane is "finished".

Annual pruning of the trailing berries consists of:—

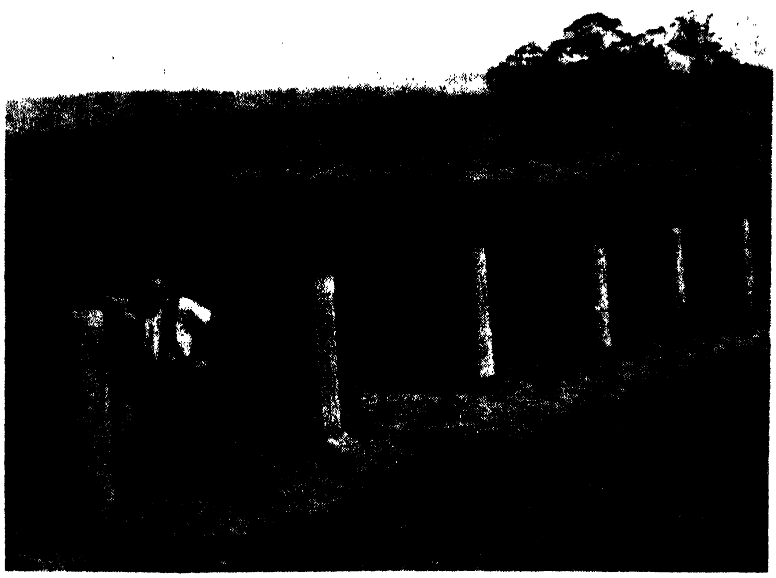
(*a*) Eliminating all canes which have cropped.

(*b*) Selecting the strongest new canes for cropping the following season.

The single wire trellis is recommended for these berries, with the wire placed about 4 feet 6 inches above ground level. Either barbed or plain wire can be used; the barbed wire will make tying up of canes easier, but more difficult to remove.

Following the removal from the wire of the canes which cropped the previous season, the canes trailing along the ground are sorted out, bunched together, taken up to and wrapped around the wire. It is advisable to cut the bunched canes back to the heavier and more mature wood. Side lateral growths, if weak, are shortened back to one or two eyes, and stronger lateral growths left up to 6 inches or so in length. Hard pruning is necessary for annual production of strong canes.

Youngberries and Boysenberries on Mr. Ridley's Property at Robertson.



Youngberries on Single Barbed Wire Trellis.

Cultural Operations.

Berry fruits require plenty of soil moisture. Any weed or other growth between the plants which may interfere with the soil moisture requirements of the berries should be eliminated. Otherwise, the least cultivation given the better, and especially during the spring and summer period.

These berry plants are shallow rooted, and this must be kept in mind at all times. In destroying green matter between rows of

plants, especially close up to the harvest period, only shallow cultivation implements should be used.

If the canes which have finished cropping are cut out immediately following harvest and the new canes taken to the wire early in the year, it may be practicable to sow a green manure crop between the rows or stimulate weed growth and/or natural trefoils by an application of superphosphate. If pruning extends well into the winter green matter between the rows will render the pruning or trellising of canes most difficult.

Irrigation.

In most districts in New South Wales, indifferent results will be obtained with these berries unless lack of rainfall is made up by irrigation. Even in our wetter districts there are dry periods which play havoc with the crop and with yields. The period from blossoming to maturity of fruit is only short, and these berry fruits not only require sufficient soil moisture to carry the crop, but also to produce a complete set of new canes for the following season's crop.

For successful berry culture, except in our highest rainfall districts, the use of irrigation water is necessary.

Crop Yields.

Little information is available in New South Wales on which to base yields. Generally, the Youngberry is a heavier cropper than the Boysenberry. Many factors will influence yield, but as a basis it is suggested that, given reasonable treatment, the plants should commence cropping in their third season with probably 2-3 lb. per plant. At five years the yield could be 4-6 lb. per plant, and from this stage onwards should average in the vicinity of 6-8 lb., with a total plant life of around fifteen years.

The Use and Construction of Boning Rods.

A. E. VINCENT, Fruit Inspector.

THE use of boning rods is a very simple and old method of determining any unevenness of a slope, and indicating where corrections are necessary. These rods have been in use by drainers for many years in connection with trench excavations for lines of pipes where an even fall is essential. Their very simplicity and the ease with which a set can be made, make boning rods particularly adaptable to irrigation farming.

Boning rods will not show the difference in height between the top and bottom of the run. This can only be determined with a level, but where the grade is suitable between head ditch and drain, boning rods will show any high or low spots along this run. Any high or low spots found can be corrected with the grader. For successful irrigation it is essential that the grade down the furrows shall be uniform from head-ditch to drain.

Briefly a set of boning rods consists of three "T"-shaped frames, two of which are pointed and sufficiently longer than the third that when these two are driven into the ground all three are the same height. In use the pointed "T" pieces are driven into the ground, one at the top of the run and

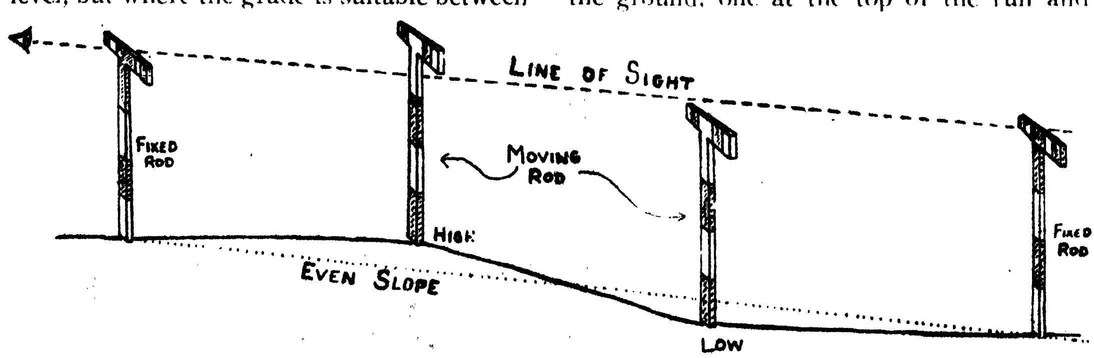


Fig. 1.—Diagram Showing a Method of Taking a Line of Sight with Boning Rods. High and low spots are indicated.

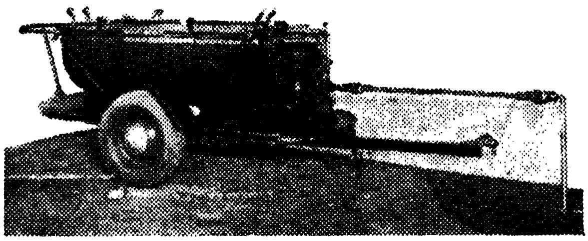
Buzacott

MODERN SPRAYERS

A FULL RANGE

from . .

LARGE CAPACITY TRACTOR TRAILER POWER TAKE-OFF MODEL



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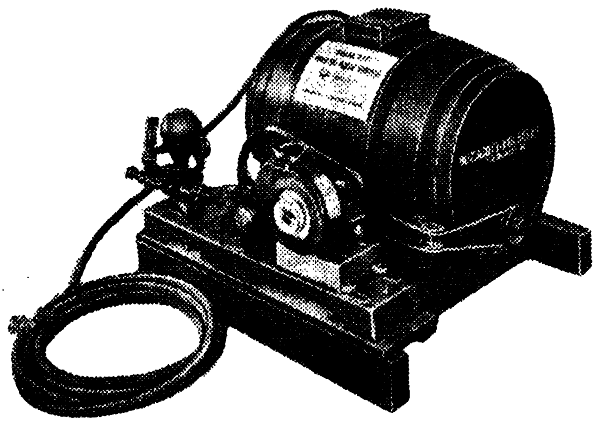

Also . . **BARREL SPRAYERS, KNAPSACK AND HAND ATOMISERS FOR ALL PEST AND WEED CONTROL SPRAYING**

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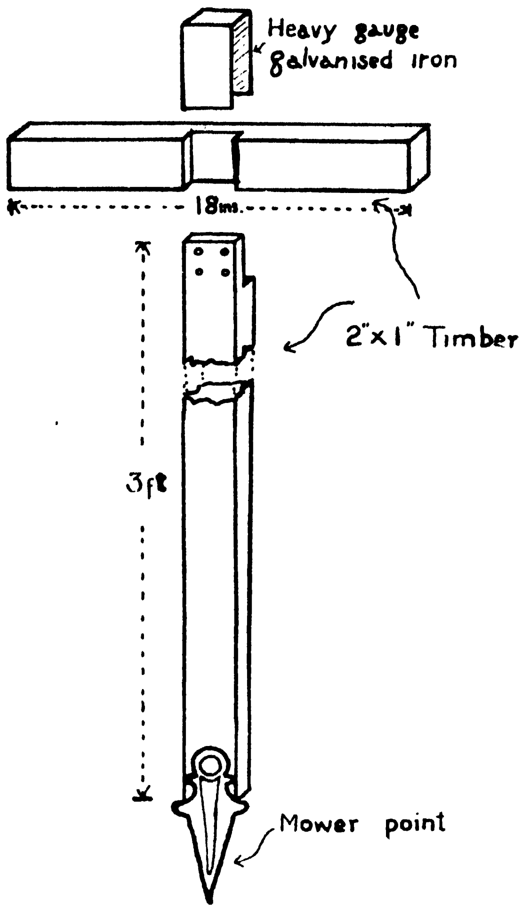


Fig. 2.—Details of Construction of Boning Rod.

the other at the bottom. The third is moved up or down the slope between the fixed pieces. A line of sight is taken along the top of the fixed rods and high or low spots will be shown when the top of the moving rod is above or below this line of sight (see Fig. 1).

A set of pegs, painted in two colours, one colour for low spots and the other for high, can be used in conjunction with the boning rods, to simplify the following grading operations. As the moving rod proceeds along the run and a low spot is encountered, a peg is driven in at the commencement and another of similar colour at the end of the depression. The extent of the spot can readily be seen, making the grading job easier. Pegs of the other colour can be used in a similar manner for high spots.

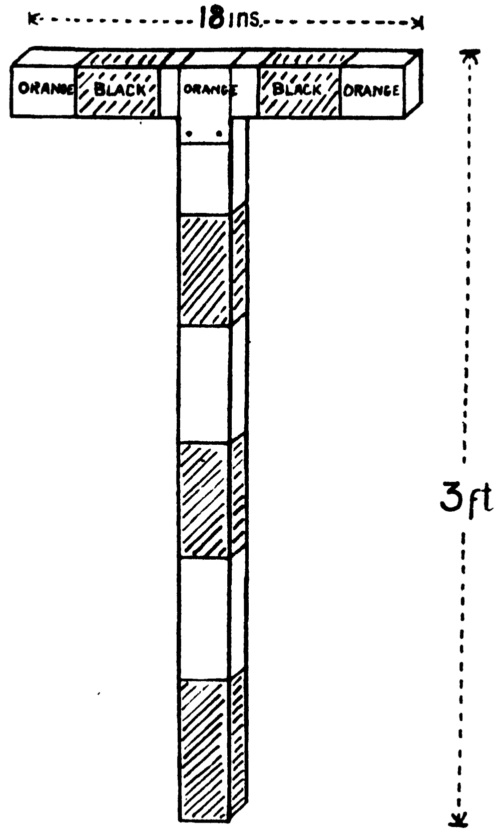


Fig. 3.—The Rod Completed and Painted.

The depth or height of any uneven patches can also be determined by placing the moving rod on a peg, which should be driven into the ground in one of these spots until the top of the moving rod coincides with the line of sight along the top of the two fixed rods.

A set of boning rods can be simply constructed from 2 inch x 1 inch timber for both upright and cross-pieces, the timber required being:—

3 pieces: 3 ft. long for uprights.

3 pieces: 18 in. long for cross-pieces.

A height of 3 feet is very convenient, and allows for ease in taking and maintaining a line of sight.

Each 18-inch piece of timber is fixed at right angles to one of the longer pieces to form a "T". While various methods of joining may be used for this purpose, one of the simplest and neatest is the halved joint

(*Continued on page* 486.)

Part of Hawkesbury College Apiary.

Apiary Notes.

Some Items of Current Interest.

D. L. MORISON, B.V.Sc., Apiary Branch.

IT is opportune at this time of the year to outline recent developments in the industry and to discuss some items of current interest.

The past season was above the average for production of honey in New South Wales, especially in the northern half of the State; however, in some other Divisions it was very "patchy," while on the South Coast practically no honey was produced. Prospects for the coming season are fair, although yields will probably again be very variable.

The South Coast and Tablelands appear to be the most promising areas. On the South Coast bud is apparent on many species including Grey Ironbark, Blue Box and Spotted Gum. On the Southern Tablelands the Red Stringybark and Paterson's Curse show promise. It is to be hoped that beekeepers will avoid any unnecessary overcrowding, this season, by doing their best to distribute apiaries over the country available.

Feeding Cakes of Pollen and Soybean Flour.
Winter cluster feeding on cake, which is covered with waxed paper to keep it moist.
[*After Schaefer and Farrer.*

The Materials Supply Position.

The materials supply position is no better than it was last year, and there does not appear to be much prospect of improvement in the near future. However, despite this shortage of materials there has been a very great increase in the number of colonies of bees kept in New South Wales during recent years; in fact many of the big beekeepers seem to have more colonies of bees than they can adequately care for. The securing of experienced labour constitutes a difficult problem.

While it is impossible to predict the economic future of the beekeeping industry, the fact is that, at present, like many other industries, it is facing a shortage of materials—with rising costs for same, tending to restrict production—together with an assured market for its product.

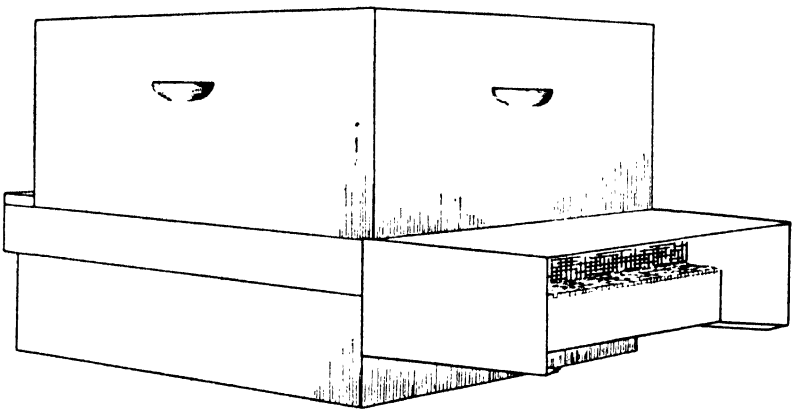
Under such circumstances it is especially important that the best use be made of available materials and labour, if the operator is to secure a reasonable margin of profit after the fixed price for honey is received for the crop and "overhead" expenses have been met.

Pollen Substitutes.

During the last year or so many beekeepers have been trying out various pollen substitutes, and the reports of the success or otherwise of their use have been many and varied. Some report that the substitutes are highly successful, while others are far from satisfied. One rather irate beekeeper believes that a pollen substitute killed his colonies out entirely.

This state of affairs is, of course, only to be expected when one considers the wide variety of conditions under which the various apiaries were being operated. Many beekeepers have started off with the idea that to be successful, a pollen substitute must promote prolific brood-rearing whenever it is supplied—without giving due consideration to the host of other factors which may be operating to prevent such an occurrence, e.g., low temperature, weak colony strength, heavy honey flows, lack of water, etc. Under many circumstances bees will not rear brood, even though an abundance of natural pollen of good quality is available in the hive.

On one occasion a beekeeper blamed the substitute for "poisoning" his bees when they were working a White Box flow in the winter, whereas the bees actually died of dysentery.



Pollen Trap in Position at Entrance of Ten-frame Hive.

[*After Schaefer and Farrer.*

No one medicine is a cure for all diseases, neither can a pollen substitute be a cure-all for all conditions which tend to depress brood-rearing or deplete colony strength. Pollen substitutes must be used rationally if they are to prove their true worth and be economic.

The latest publication on pollen substitutes to hand is United States Department of Agriculture Circular E531. It states that no satisfactory, complete substitute for pollen has yet been found, and advises the feeding of 25-50 per cent. of "trapped" (natural) pollen with soybean flour.

Bees take some time to become accustomed to pollen traps, which should, therefore, be

kept on the one hive for a considerable period to ensure efficient working.

The trapping, drying and storage of pollen requires some care. In the publication referred to it is recommended that the following mixture be fed as a cake above the frames:—

"Add 5 lb. of natural pollen to 14 lb. of hot water, then stir in 26 lb. of sugar until dissolved or in suspension; and finally add 15 lb. of soybean flour and mix thoroughly. Where the trapped pollen supply is abundant the percentage can be increased from 25 to 50 per cent. and less syrup will be required."

The Sulphonamides and Foul Brood Control.

When reports first came to hand of attempts to control American Foul Brood by treating with various sulphonamides, a cautious attitude was taken for the following reason: A sulphonamide acts by combining with para-amino benzoic acid, which is an essential nutrient for some types of bacteria, and renders it unavailable. Judging by the temporary arrest of the disease in colonies treated with sulphonamides, *Bacillus larvae* is one of those bacteria which require this acid nutrient for growth. However, the drug would only arrest the disease and would most certainly not kill the spores. Moreover, there would be many spores in scales, propolis, etc., which would not even come into contact with the drug.

The sulphonamides are rapidly eliminated from the colony, and in order to keep American Foul Brood down, the colony must be continually fed the medicated syrup, since the organisms have not been killed but their growth merely arrested. As soon as feeding is discontinued the disease is likely to manifest itself once more.

The attitude of this Department in not accepting sulphonamides for American Foul Brood control has been vindicated by recent happenings in the United States of America, where the use of these drugs has actually resulted in the spread of American Foul Brood by the creation of "carrier" colonies, from which the disease was subsequently spread when treatment was discontinued.

The burning of infected hives of bees as practised in New South Wales is a far safer and easier method of controlling the disease than attempting the wholesale, continuous feeding of sulphonamides in apiaries in which American Foul Brood has occurred. Beekeepers are compensated for infected materials which are destroyed by order of an Apiary Inspector.

Haymaking—*continued from page 466.*

to horses as it gives rise to kidney trouble and affects the joints of the feet, causing lameness. However, up to a quarter of the hay ration for horses can consist of millet hay with safety.

Under certain conditions grain sorghum and other summer cereal crops can be cut for hay. These crops are, however, rather coarse and not to be compared with prime cereal hay.

(*To be continued.*)

The Use and Construction of Boning Rods.—*continued from page 483.*

(see Fig. 2). A sheath of heavy gauge galvanised iron, fitted over the joint, will protect the rods when it is necessary to use a mallet or hammer to drive them into the ground.

Worn hay mower points are very suitable for pointing the two fixed rods, and are easily fixed with a single bolt. When completed the rods should be painted with alternate bands of black and orange paint, using a different design for each rod. This makes them readily distinguishable in the field and allows for an accurate line of sight.

BROWN ROT OF STONE FRUITS

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

BROWN ROT, caused by the fungus *Sclerotinia fructicola*, is the most serious fungous disease of stone fruits, and can destroy an entire crop. The two most serious effects of the disease are the prevention of the setting of fruit by the destruction of blossoms, and the production of a rot on mature and nearly mature fruit, both on the tree and after harvesting. Leaf and shoot infections also occur.

Some degree of Brown Rot infection can be anticipated every year in coastal districts in New South Wales, but in most other areas within the State the disease tends to occur at irregular intervals. However, in those years during which it does occur, the effects of this disease may be so devastating that the adoption of basic control measures as a routine each season is a sound insurance policy.

As in the case of other plant diseases which are caused by parasitic organisms, the development of Brown Rot is greatly influenced by prevailing weather conditions. If the fungus is present, and if control measures are not adequately practised, it is the weather conditions which determine whether or not an epidemic of the disease will occur. The most favourable conditions for blossom blight are humid or showery weather with mild day temperatures (in the vicinity of 68 to 77 deg. Fahr.) and cool to cold nights. Fruit rotting proceeds most rapidly with high humidity and high temperature.

Symptoms of the Disease and the Disease Cycle.

Blossom Blight.—When weather conditions are favourable, and particularly when a wet spring follows a cold winter, the fungus will cause a blight of blossoms (see Fig. 2) which can be so serious that very little fruit is set. When blossoms are attacked they die and turn brown, some falling, whilst others persist for several weeks adhering to the gum which is formed as the result of infection of the shoot. Under moist conditions, pustules of spores of the fungus may be seen on the dead blossoms. These spores can cause further infections of blossoms and shoots.

Shoot Infection.—Following the blossom blight, shoot infection (see Fig. 3) frequently occurs. This is evident, as small cankers,* with which small amounts of gum are frequently associated. Shoot infections may occur either directly or as a result of the progression of the fungus from the infected blossoms into the shoot. Conversely, blossom infection may occur as a result of the progression of the fungus from infected shoots into the blossoms.

* A canker is an area of dead or dying bark, usually sunken, the edges of which are sharply defined.

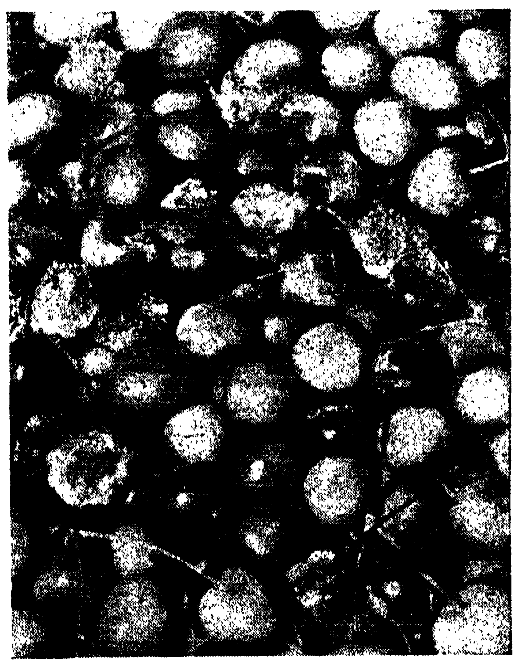


Fig. 1—Cherries affected with Brown Rot.

Note brown spots on the skin of the fruit and the development of ashy-grey powdery tufts of the fungus.

Shoot infection can also occur towards the end of the season when the fungus grows down the stalk of infected fruits into the lateral, where it produces small cankers (see Fig. 7) which may extend until a large branch is reached. Infected shoots and branches frequently die as a result of having been girdled by the canker.

If not removed, these diseased shoots and limbs act as important sources of infection, for under favourable conditions myriads of spores of the fungus are produced upon them. The same cankers may continue to produce spores during subsequent years.

Fig. 2—Twig and Blossom Blight on Apricot.
Infected shoots of this nature are a source of danger to the crop and should be removed and destroyed. This blasting of blossoms can occur over an entire tree, thus preventing the setting of fruit.

Leaf Infection.—Infected leaves show brown, more or less circular dead areas, which later may fall away giving a "shot hole" appearance (see Fig. 4). In severe cases leaves may be killed outright.

Fruit Infection.—Following the blossom blight, developing fruits may be attacked, but in normal seasons this is not a serious feature during the period from shuck fall to the initial stages of maturity.

The disease first becomes evident on the skin of the fruit as small brown spots, which rapidly develop into a characteristic brown rot. Small, scattered, ashy-grey powdery tufts of spores of the fungus appear upon the discoloured areas about thirty-six hours after infection, and within three to five days the fruit may become discoloured and rotted throughout.

The infected fruits either fall to the ground or remain attached to or lodged in the tree, and are then known as "mummies." These mummies can produce spores (which represent the "seeds" of the fungus) over long periods. In spring, if the weather is favourable to the growth of the fungus, mummies, which are partly embedded in, or lightly covered by the soil, will produce small, brown, cornet-shaped, fleshy structures (Fig. 8). These structures, which are from one-eighth to one-half of an inch across, produce spores which invade the blossoms and twigs to cause severe blighting, and thus recommence the disease cycle outlined above. Unless disturbed, the mummies in the soil may continue to produce these fleshy structures for a number of years.

The above aspects of the disease cycle should be borne in mind when considering control measures.

Control Measures.

The necessary control measures may be divided into two sections: (*a*) orchard sanitation to remove sources of infection, and (*b*) spraying to protect the most susceptible parts of the tree from attack by the fungus.

It is important to realise that unless sanitation measures are thoroughly carried out, the application of sprays will be of little avail, for they cannot maintain a continuous protective covering over the rapidly growing susceptible parts of the tree, unless applied at uneconomically frequent intervals. Spores from an infection centre (where they are produced in myriads under favourable conditions) are readily carried by air currents, and would be constantly falling on these unprotected portions.

Care should be taken to see that the sanitation measures outlined below are carried out thoroughly throughout the entire orchard. Where growers are concerned about trees in garden lots, efforts should be made to have all neighbours adopt measures for the control of the disease, as success is more easily achieved when action is taken on a community basis.

Orchard Sanitation—

1. When picking, sound and healthy fruit should be harvested first, as this minimises the spread of spores from diseased to healthy fruits, and thus reduces the risk of infection during transit to market.

2. Diseased and mummied fruit should be removed from the trees and the ground immediately after picking. If these fruits

Fig. 3—Brown Rot on Peach Laterals.
Note the outlines of the cankers. Ashy-grey pustules of spores may be seen on the cankered area of the lowest lateral. This lateral has been completely girdled by the canker.
[After Cunningham.

can be picked up before they rot down too much, the job is easier. They should be destroyed by burying to such a depth that they are covered by at least six inches of soil.

Fig 4—Peach Leaf Infected by the Brown Rot Fungus.
Note the more or less circular, brown, dead areas which are commencing to break away from the remaining healthy leaf tissues.
[After Cunningham.

3. If a serious outbreak of the disease has occurred, it is advisable to prune the trees in early autumn whilst still in leaf, for at this time all cankers and dead shoots are more easily seen. If the outbreak has not been serious, pruning can be carried out as normally, in the dormant period, taking care to cut out and destroy all diseased and dead shoots.

Trees should be pruned and shaped so that sprays may be applied effectively, for those which are too dense or too tall cannot be sprayed properly unless special elevated platforms are used.

4. During pruning make a further check for mummified fruits, both on the ground and attached to, or lodged in, the trees, paying particular attention to the crotch of the tree. Any mummies collected at this stage should be burned with the prunings.

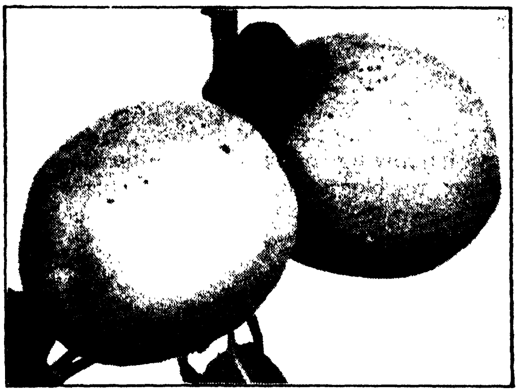


Fig. 5—Dead Apricot Wedged Between Two Healthy Fruits.
This is likely to provide a brown rot infection of maturing fruit. Shaking the tree often dislodges these dead fruit.

5. It is advisable that any ploughing which is to be done should be completed before blossoming. However, this should not be done at the expense of cover crops. (If in doubt about this point, consult your local Fruit Officer.) Except for small fruits like cherries, where collecting from the ground is very difficult, the practice of ploughing for the purpose of burying mummies is of doubtful value, because adequate coverage with soil is not always achieved. Furthermore, there remains the danger that the mummies may be brought to the surface again at the next ploughing, and will still be capable of producing spores, for the fungus may live on in the

Fig. 6—Fully Rotted Peaches which will soon be "Mummied."
The surfaces of these fruits are covered with spores of the brown rot fungus. Destroy them before they destroy your next season's crop.

mummies or fragments of mummies for several years. However, mummies will not produce apothecia (see Fig. 8) if disturbed by harrowing or a light cultivation just prior to blossoming. If this practice is

Fig. 7—Mummied Peach Attached to Branch.
Note the young canker caused by the growth of the fungus down the fruit stalk, and into the branch.
[*After Heald.*

adopted, all soil in the orchard must be disturbed to a depth of about 3 inches. Soil close up to the tree would need to be cultivated by hand implements.

6. Towards the end of the blossoming period, remove and burn all blighted blossoms and diseased shoots. When thinning, make a further check for diseased shoots.

7. During the growing season, all shrivelling or dead fruits noticed (see Fig. 5) should be removed. These have no resistance to the fungus and once infected act as centres for the spread of Brown Rot. Hail- and insect-damaged fruit is also dangerous.

8. All fruit which has fallen from the tree during the ripening period should be removed and destroyed in accordance with the regulations under the Plant Diseases Act for the control of fruit fly. This will help to minimise the risk of spread of the Brown Rot disease during the season.

Protective Spraying—

1. At bud-swell to late bud-swell (pinking), spray with Bordeaux mixture† (15-15-100 plus half a gallon of white oil) or lime sulphur (1 gallon to 20 gallons of water). This bud-swell spray is particularly important, and is also recommended for the control of leaf curl, shot hole, freckle and rust.

2. Further protective sprays should be applied at the following stages:—

   (i) At "blossoming," when the majority of blossoms have fallen.

   (ii) At "shuck-fall" (when the flower remnants are shedding from the fruit).

   (iii) If showery weather is experienced and if blossom blighting has occurred, sprays may be applied at intervals of four weeks (or when required) between "shuck-fall" and harvest.

† This formula for Bordeaux mixture means:—Copper sulphate (bluestone) 15 lb.; good quality hydrated lime 15 lb. (or rock lime 10 lb.); water 100 gallons. Dissolve the bluestone in most of the water, in a non-metallic (except copper) container; break down the lime in a bucket of water and add, through a fine strainer, to the bluestone solution, stirring continously. Break down the oil in a little water and add last, making up to the required quantity of water.

Further details of the preparation of Bordeaux mixture are given in Spray Leaflet No. 1 obtainable from the Division of Information, Department of Agriculture, Box 36A, G.P.O., Sydney.

MONTHLY EXCURSIONS

●

During the next three months railway excursion tickets will be issued for travel between 14th and 18th September, between 13th and 16th October, and between 10th and 13th November.

The issue of these tickets enables the train traveller to have a forward and return trip at the cost of the single journey, and to make the return journey at any time up to two months after the date of issue of the ticket.

It should be noted, however, that excursion tickets are not issued for journeys wholly within the railway tourist area. (This area extends from Sydney as far as Nowra, Canberra, Orange, Mudgee, Singleton and Dungog, and special excursion tickets are issued for travel therein every week-end.)

Another item to note is that the days quoted above for each month cover all lines and that excursion tickets are only issued for the forward journeys on a particular line on one day of each month by a specified train. Details of excursion trains are obtainable from railway booking offices several weeks in advance of the days of departure.

S. R. NICHOLAS,
Secretary for Railways.

(iv) If the weather is very humid, a spray should be applied during the seven-day period prior to harvesting. With cherries, sprays may be applied between pickings if required.

The following are the sprays which can be used at the above stages (when the trees are in leaf) :—

(*a*) Lime sulphur (1 gallon to 160 gallons of water, *i.e.*, 5 pints per 100 gallons) ; or
(*b*) colloidal sulphur (2 lb. per 100 gallons of water) ; or
(*c*) wettable sulphur (5 lb. per 100 gallons of water, or, as recommended by the manufacturer, according to grade) ; or
(*d*) Bordeaux mixture 1½-1-80 plus ½ a gallon of white oil.

The correct spray to use will depend on the type of stone fruit and the district in which it is grown, as indicated below:—

MURRUMBIDGEE IRRIGATION AREA—

Bordeaux mixture (1½-1-80 plus ½ a gallon of white oil) may be used, provided that, with peach and nectarine, the trees have been irrigated within the period of two to three weeks prior to the application of the spray. *Lime sulphur must not be used.*

OTHER INLAND AREAS—

The sulphur sprays may be used, but *not Bordeaux mixture.*

COASTAL AREAS—

(*a*) Early varieties of peaches.—

Do not use Bordeaux mixture or other copper spray, or lime sulphur. Other sulphur sprays are safe to use.

Fig. 8—A "Mummied" Fruit Bearing a Crop of the Fungous Structures (apothecia) from which a New Spore Generation is Disseminated.

These structures, which are from one-eighth to one-half inch in diameter, produce millions of spores. These spores, which are produced in spring at blossoming time, are capable of causing a devastating blossom blight.

(*b*) Early varieties of apricots.—

Sulphur sprays in any form should not be applied, because of the danger from "sulphur shock." Bordeaux mixture (1½-1-80 plus ½ gallon of white oil) may be used, or copper oxychloride (½ to 80 gallons plus ½ gallon of white oil). Proprietary preparations of copper oxychloride are available.

It is recommended that an efficient wetting and spreading agent, of which several commercial types are available, should be added to the above sprays.

MYCORRHIZA IS NOT IMPORTANT IN GENERAL AGRICULTURE.

THE term "mycorrhiza" is the name given to the beneficial relationship between the roots of plants and certain fungi. Farmers have learned of the great value of inoculating seeds of leguminous plants such as lucerne, with root nodule bacteria, and have read of the important part played by certain fungi growing in association with pine trees and orchids. Reports of mycorrhiza on other plants, such as citrus, are published from time to time and it is reasonable that growers should hope to benefit by inoculating their trees; but a close examination of the known facts indicates that no worthwhile results are likely to be obtained by such procedure.

In general the relationship between the fungus and the root seems to be a controlled parasitism, the root cell ultimately digesting the invading fungus hyphae.

In pines, where the amount of fungus growth on the surface of the mycorrhizal roots and in the surface layers of the roots

(*Continued on page* 498.)

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

Green Feed—Its Value and Replacement in Breeding, Growing and Laying Poultry Rations.

G. L. McCLYMONT, B.V.Sc., and L. HART, B.V.Sc., Veterinary Research Officers.

GREEN feed is rightly recognised as a valuable constituent of rations for all poultry and, in particular, for breeding hens.

However, droughts, water restrictions or insufficient labour frequently result in a shortage of green feed. Knowledge of the factors in green feed that make it such a valuable constituent of rations is essential for all poultry farmers who may be faced with the problem of overcoming such shortages.

The Composition of Green Feed.

Young, leafy green feed of all types, such as oats, barley, clovers, lucerne, etc., on the average contains the following:—

Water.—An amount up to 70-80 per. cent. This point is important; it means that 3 to 4 lb. green feed are required to supply as much dry food matter as 1 lb. of meals or grain; 70 lb. of mash and 30 lb. of green feed are not equivalent to 100 lb. of mash, but only to $70 + \frac{30}{3} = 80$ lb. of mash.

Vitamin A.—Carotene, an orange-coloured pigment in green feed (which is masked by the green pigment in the feed) is converted in the animal body to colourless vitamin A, essential for health and egg production. A minimum of about 1/3rd ounce of good, young, leafy green feed per head per day supplies sufficient vitamin A for adult stock for health and egg production. A safe allowance is 4 lb. per 100 birds per day of good leafy feed, and 6 lb. of green feed of poorer quality.

Riboflavin.—This vitamin is essential for growth of chickens and maximum hatchability. Green feed contains about 15 parts of riboflavin per million parts of dry matter (equivalent to about 3 parts per million if calculated on the fresh green feed), as compared with 20-30 in milk powders and liver meal and only 1 in grains and 2 to 3 in mill offals. Birds require about 2½ parts of riboflavin per million parts of feed for maximum hatchability, and about 3 parts per million for growth of young chickens. Where adult birds are given as much green feed as they can eat, they will take up to 2 ounces of green feed per bird per day, which is equivalent, as regards riboflavin, to about 12 per cent. of milk powders or 15 per cent. of lucerne meal in the mash of a mash-grain ration.

Other Vitamins.—Green feed is a rich source of most of the other vitamins required by poultry, but there is, as yet, no evidence that these vitamins are likely to be factors limiting growth, egg production or hatchability on practical type rations.

Minerals.—Young, leafy green feed has quite a high content of minerals, but their importance is small in view of the relatively small part of the diet that green feed usually supplies. For instance, lucerne, one of the richest feeds in calcium, supplies only one-twenty-fifth of the birds' requirements of this mineral, even if they eat 2 ozs. each per day. Other rich sources of calcium, such as shellgrit or ground limestone, are necessary.

Protein.—The protein content of young, leafy green feed may be up to 20 per cent. or more of the dry matter (4 per cent. of the fresh weight), and a generous allowance of green feed will help the protein supply. However, poor, mature green feed may contain only about 10 per cent. of protein in the dry matter, and may actually decrease the protein percentage of the ration.

Yolk Pigments.—Pigments in green feed, which are stored in the legs of the birds and the yolks of the eggs, to give the typical yellow colour, are not essential either for the bird, the chicken, or the consumer of the egg. Their only value is that they indicate the amount of green feed being obtained by the birds. However, where fish oils are used to replace green feed a pale egg could have a vitamin A potency as high or higher than an egg from birds fed liberally on green feed.

Replacing Green Feed.

When green feed is in short supply or not available, the poultry farmer has no option; he must seek replacements.

Where it is available, the choice between green feed and its replacements must depend on a decision as to which is the lesser—

(1) The cost of providing green feed (seed, water, labour entailed in daily cutting, chaffing and distribution, etc.); or

(2) The cost of substitutes (fish oil, and lucerne meal, or milk powders).

FOR BREEDING STOCK.

Where green feed is in short supply for breeding stock, low hatchability and vitamin A deficiency (nutritional roup) affecting health and egg production can be expected.

How can green feed, supplying vitamin A and riboflavin, be replaced for breeding stock, or supplemented when it is in short supply?

Recent experiments at the Poultry Experiment Farm, Seven Hills, have thrown considerable light on this question. Even where there is not sufficient green feed to supply enough vitamin A for health and egg production, no improvement in hatchability could be obtained by giving extra vitamin A as fish oils. That is, the experiments showed that vitamin A, in itself, is not necessary for hatchability.

In the experiment which led to this conclusion, White Leghorn pullets were fed a diet adequate in all nutrients (protein, minerals, riboflavin, manganese, etc.), but with no vitamin A supplement, and the hatchability of these birds compared with the hatchability of a group on a similar ration, except that it was supplemented with vitamin A as green feed. The egg production of the birds on the vitamin A-deficient ration gradually decreased as their vitamin A reserves were drawn on and within a few months most of the birds had died of vitamin A deficiency, *but the hatchability of the eggs laid on the vitamin A-deficient ration did not decrease in comparison with hatchability of eggs from the vitamin A rich diet!* Even a study of the records of individual birds which eventually stopped laying due to vitamin A deficiency, did not indicate any downwards trend in hatchability, in comparison with birds on adequate vitamin A.

Practical Application of These Results.

Where Breeding Stock are Without any Green Feed.—(1) Supply vitamin A requirements by fish oils, the amount of oil depending on its potency. Use 4 fluid ounces of 5,000 unit potency (5,000 International Units per gram), or 20 fluid ounces (1 pint) of 1,000 unit potency oil per 100 lb. mash with a mash-grain ration. For an all-mash ration, use half these amounts. Hatchability will not be affected by the level of oil, *i.e.*, hatchability will not be increased or decreased by levels above (unless an excess is given) or below these amounts of oil. Insufficient oil will result in lowered egg production and, if the deficiency progresses, eventual death of birds, but not lowered hatchability.

(2) Replace the riboflavin normally supplied by the green feed by increasing the amount of other riboflavin-rich feeds such as lucerne meal, milk powders, liver meal or synthetic riboflavin. Lucerne meal will also help to produce yellow-legged chickens.

The value of a full feed of green feed for providing riboflavin for hatchability is shown by following figures from experiments at Seven Hills:—

Ration.	Hatchability Per cent.
Mash of wheatmeal, meatmeal, oil meals and fish oil with no mill offals, and wheat grain ..	44
The same ration supplemented with green feed *ad lib.*, instead of fish oil	74
The same ration with green feed *ad lib.*, instead of fish oil plus synthetic riboflavin	82

The green feed markedly improved hatchability but additional riboflavin on top of that supplied by a full feed of green feed further improved it. The smaller the amount or the poorer the quality of green feed supplied, the greater the need for extra riboflavin supplements.

Where Green Feed is in Short Supply for Breeding Stock.—If sufficient green feed is being supplied for health and maintenance of egg production, no good purpose, as regards hatchability, will be served by supplying extra vitamin A as fish oils. As mentioned above, 4 lb. of green feed per hundred birds per day will supply requirements. Given green feed *ad lib.*, birds will eat over 12 lb. per hundred birds per day.

When green feed supplies fall below the 4 lb. per hundred birds per day, fish oils should be used.

There is no evidence that the growth or death rate of chickens is affected by the level of vitamin A in the hens' diet, as long as the hens are receiving sufficient vitamin A for health and egg production and the chickens are put on a diet adequate in vitamin A.

The need for additional riboflavin supplements, such as milk powders, etc., is, of course, the greater, the more acute the shortage of green feed.

REPLACING GREEN FEED FOR GROWING STOCK.

Green feed supplies vitamin A, essential for growth and health, and for young chickens up to six weeks may provide a considerable part of their riboflavin requirements. When green feed is in short supply or absent, fish oils can adequately provide vitamin A (1 fluid ounce of 5,000 unit potency oil, or 5 fluid ounces of 1,000 unit potency oil, per hundred pounds of "all-mash" or twice the quantities in the mash of a mash-grain ration); and riboflavin-rich feeds such as milk powders, liver meal, lucerne meal, should be increased to allow for the lower intake of riboflavin. Lucerne meal will also help to provide yellow-legged chickens.

REPLACING GREEN FEED FOR LAYING STOCK.

The main contribution of green feed to the diet of laying stock is vitamin A. The riboflavin supplied is not needed by laying stock in producing eggs not required for hatching. A generous supply of green feed will also reduce the grain and meal consumption by up to 10 per cent.

However, there is no evidence that green feed for laying stock cannot be completely replaced by fish oils. Experiments at Seven Hills, where the main differences between rations has been the use of fish oil instead of green feed as a source of vitamin A, have shown no significant difference in egg production, although hatchability may be affected.

Where fish oils completely replace green feed, pale egg yolks will result but, as indicated previously, their food value is not impaired. However, yolk colour can be maintained to a large extent by feeding lucerne meal, up to 10 per cent. in rations, or including yellow maize in the diet if it is comparable in price to the other grains.

Summary.

Vitamin A, as supplied by green feed and fish oils, is essential for growth, health and egg production, but experiments have shown that even such a low intake of vitamin A as affects egg production and health will not affect hatchability.

When green feed is in short supply or not available, or it is cheaper or more convenient to use substitutes for green feed, the following methods of substitution may be used:—

Breeding Stock.—Where there is sufficient green feed for egg production and health (over 4 lb. per hundred birds per day), use riboflavin-rich supplements only. Where there is no green feed or less than 4 lb. per hundred birds per day, use fish oils to provide vitamin A and a greater amount of riboflavin-rich supplements. To ensure yellow-legged chickens include lucerne meal in the ration.

Growing Stock.—Where green feed is in short supply or absent, use fish oils for vitamin A, and for stock under twelve weeks old, a greater amount of riboflavin-rich supplements than would be used if green feed were fed.

(*Continued on page* 498.)

"Phenovis" worm remedy.

COCCIDIOSIS

A Devastating Disease of Poultry

L. HART, B.V.Sc., H.D.A., Veterinary Research Officer.

COCCIDIOSIS is one of the most devastating diseases of poultry, and is widespread throughout New South Wales. Turkeys, ducks, geese and other birds as well as fowls may be affected, but each species of bird has its own species of coccidiosis, and thus fowls cannot pick up the disease from turkeys and other birds, and vice versa.

Greatest losses occur in chickens, but infection in adult fowls may be serious. The infection may not only prove fatal, but most affected birds which recover are considerably retarded in development and many never develop into adults worth keeping. In fact some American workers consider it uneconomic to rear survivors. Additionally the mortality is often sustained too late in the season to enable replacements to be reared, thus leaving the poultry farmer with a reduced flock of layers.

Cause.

The infective agents are protozoan parasites. These are single-celled organisms belonging to the animal kingdom, and there are known to be at least seven different species capable of attacking fowls; three or four of these are particularly destructive.

Two forms of the disease occur—

(1) Caecal coccidiosis, affecting the blind guts or caeca.

(2) Intestinal coccidiosis, affecting the small intestine.

The caecal form of coccidiosis occurs mostly in young chickens, but the intestinal form which may be caused by two or three species of coccidia attacks birds of all ages with equal severity, although probably the greatest losses occur in birds up to one year old.

Life Cycle.

The coccidiosis parasite reproduces in two different ways, asexual, and sexual.

(*a*) *Asexual Reproduction.*—Birds become infected by ingesting "sporulated" oocysts. These are the end result of sexual reproduction, and are microscopic egg-like bodies which are able to live in shady positions for long periods. Before they become infective they must "sporulate," and for this warmth and moisture are necessary. Given optimum conditions (warmth and moisture), about 48 hours are required to complete sporulation, and during the process eight parasites are formed in each oocyst. When such a sporulated oocyst is eaten by a bird the envelope or shell is dissolved and the eight parasites set free. These immediately attack the cells lining the gut (small intestine or caeca as the case may be) and having entered, proceed to multiply rapidly, each of the original eight parasites from the one oocyst producing up to about three hundred parasites.

The infected cells of the gut are destroyed and rupture, releasing the hundreds of new parasites which enter other lining cells and repeat the process. This type of reproduction is repeated several times, but usually fairly soon the sexual reproduction is initiated.

(*b*) *Sexual Reproduction.*—A parasite produced by asexual reproduction may produce a female cell or numerous male cells. The latter mature, are released and fertilise the female cells. These mature to form oocysts which pass out with the droppings. Oocysts may remain alive for several months and are the means by which the disease is spread from bird to bird. Many birds which recover from an attack become "carriers" and pass out small numbers of oocysts for several months.

Symptoms.

Caecal coccidiosis.—Birds from one week of age upwards may be affected, but most outbreaks are in chickens from 3-10 weeks of age. Affected birds appear depressed, standing huddled with ruffled feathers as if cold. Shortly after sickness is noticed, blood will usually be seen in the droppings. Mortality commences within a day or two of the first sickness, and in an acute outbreak a heavy mortality is sustained within a few days. The acute phase passes within about a week, usually leaving many stunted birds, some of which die during the next two or three weeks. Heavy mortality may occur in less acute outbreaks in which no blood may be seen in the droppings.

Intestinal Coccidiosis.—Birds of all ages may be affected, and whilst it is seen fairly frequently in chickens it is probably most serious in pullets. The symptoms are somewhat similar to the caecal form, but blood is rarely seen in the droppings, which are greyish and slimy to watery. Adult birds are often sick for some time, the disease in these being less explosive than the caecal form in chickens. In such cases birds rapidly lose condition.

Post-mortem Findings.

Caecal Coccidiosis.—In this form the disease is confined to the caeca or blind guts, which, when the disease is acute, are distended with blood. In other cases cheesy plugs will be found, and the walls of the blind guts may be ulcerated. Varying gradations of these changes may be seen.

Intestinal Coccidiosis.—The changes in this form are to be seen in the small intestine, particularly the upper and middle portions. These are greatly increased in size and thickness and grey to reddish in colour, and close examination usually reveals innumerable tiny whitish grey spots visible before the intestine is opened. The lining of the intestine is greyish, reddish and furry and specks of free blood may be present. The intestines are filled with dirty greyish slimy material in which blood may be present. No changes are evident in the blind guts.

Immunity.

Birds which recover develop a resistance. However, birds protected by treatment with drugs (see later) do not necessarily develop a resistance.

Differential Diagnosis.

The caecal form in chickens may be confused with pullorum disease, blackhead, brooder pneumonia (mycosis) or round worm infestation. The intestinal form may be confused with leucosis, or worm infestation. A laboratory examination is desirable to ensure an accurate diagnosis. This is essential in the case of blackhead, even with experienced observers. *However, as an accurate early diagnosis is imperative if treatment is to be worthwhile, scientific aid should always be sought.*

Control.

In order that the principles on which methods of control are based may be understood the following points should be remembered:—

1. Recovered chickens may continue to excrete small numbers of oocysts for many months.

2. Oocysts (the egg-like resting phase) may remain alive in sheltered situations for many months.

3. Oocysts are the means by which the disease is spread.

4. Sporulation (which takes at least 48 hours to occur) must take place before an oocyst is infective.

5. A reasonably large number of sporulated oocysts must be taken in by the bird to set up a severe attack of the disease.

Thus if chickens could be reared on "clean" ground and the attendant had no contact with the droppings of other fowls or chickens, it should be possible to avoid an outbreak of coccidiosis. Usually it is impossible to fulfil these conditions.

Somewhat similar results may be obtained by raising the chickens on wire mesh floors. However, if chickens are raised in this manner and later when placed on the ground become infected with coccidiosis, mortality is likely to be heavy.

Moisture is necessary for sporulation so that care should be taken to avoid spillage or leakage at drinking fountains. These should preferably be raised on wire netting platforms or be kept outside the brooder run.

Keeping in mind points 3, 4 and 5 above, it will be seen that frequent thorough cleaning of the brooder runs will minimise the risk of a serious outbreak. This is facilitated and is most effective, where the brooder runs are covered with an impervious smooth surface, such as concrete.

When an outbreak occurs the chickens should be provided with warm brooders, if possible. and for a week the drinking water should be replaced with 0.85 per cent. salt solution (13½ ounces salt to each 10 gallons water). In an acute outbreak of the caecal form most of the mortality will occur in the week following the appearance of symptoms.

Ordinary disinfectants are ineffective in destroying oocysts; sunlight or some form of heat or ammonia fumes being the only means of destroying them. Blow lamps and flame throwers have been advocated in the past, but experiments have shown that to be effective, the flame must be played on each portion of the floor for a considerable time, something like eight hours flaming being necessary to disinfect a floor area of 100 square feet. Live steam is very good, but impracticable on most farms.

Before treating a surface it should be thoroughly cleaned by scraping and sweeping Boiling water with 1 lb. caustic soda in each 20 gallons water will be very effective in destroying oocysts. (A leaflet on disinfection of poultry houses may be obtained from the Department.)

Keeping in mind point 5 above, it will be realised that rearing chickens on open range conditions will considerably reduce the possibility of an outbreak. In this connection the use of portable brooder houses and runs is to be recommended. They are erected on ground which has not previously run fowls, preferably on the highest part of the property. After each lot of chickens is reared, the house and run are removed to fresh ground. Two years later the same ground may be used again.

Poultry manure should not be used on areas on which green feed is grown, as oocysts may be picked up with the green feed.

Medicaments.

At the present time (1947) five medicaments can be recommended for prophylaxis or treatment of coccidiosis. *In all cases, however, hygienic measures should be instituted in conjunction with prophylaxis or treatment.*

Sulphur.—This is of use only as a prophylactic, and has no curative properties. The feeding of 5 per cent. flowers of sulphur in an all-mash, dry mash ration should prevent the occurrence of an outbreak of coccidiosis. It is necessary to commence sulphur feeding at least four days before the chickens are exposed to infection. When the weather is dull or where chickens are being reared without access to direct sunlight, vitamin D supplement should be given in twice the recommended amounts, otherwise rickets may develop.

Sulphur feeding may be continued for 6-8 weeks without causing any serious effects. Some birds may develop an oozing from the vent, and the majority probably will develop a scaly condition of the skin of the face and upper portion of the neck, on which the feathers will not grow. Most birds will be pale in comb and wattles. Weight gains will not be affected and within about a week of discontinuance of sulphur feeding the birds will return to normal.

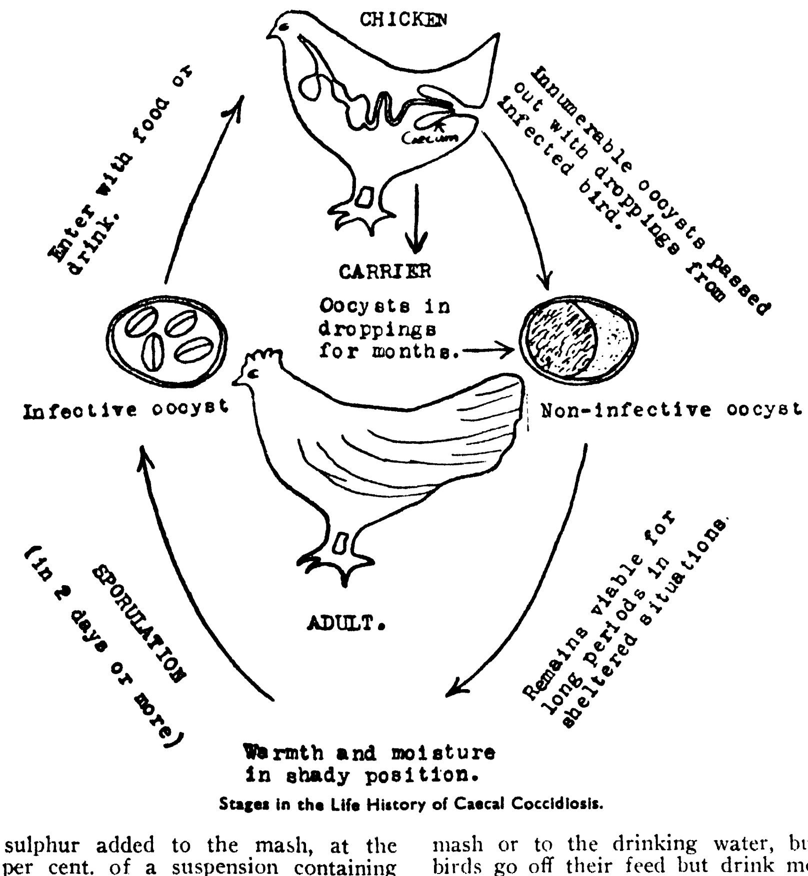
Addition of 5 per cent. charcoal along with the sulphur has been shown to increase the efficiency of the sulphur. However, the charcoal interferes with the assimilation of various vitamins, and if some of these are in amounts only just sufficient for normal development, the addition of charcoal may cause vitamin deficiency diseases.

Colloidal sulphur added to the mash, at the rate of 10 per cent. of a suspension containing 10 per cent. colloidal sulphur, will give even better results than flowers of sulphur.

Sulphaguanidine.—This is used as a prophylactic in the same way as sulphur, but at the rate of 1 per cent. in the ration. There should be no deleterious effects with this drug. Recently it has been used in America after outbreaks commence, and good results have been claimed. In this case 1 per cent. is added to the mash (all-mash, dry-mash) for two days, non-medicated mash is given for two days, medicated mash on the fifth day, non-medicated mash for four days, and medicated mash on the tenth day.

We have had no experience with the drug used in this way, but the American account is from a reliable source, and the method should be worth trying if sulphamezathine and sulphapyrazine (see below) are unavailable, or if the sulphaguanidine treatment is much cheaper. It cannot be anticipated that this treatment will reduce the mortality rate to the same extent as sulphamezathine or sulphapyrazine.

Sulphamezathine (or sulphamethazine).—This drug is to be used after an outbreak commences, and if used according to directions, spectacular results should be obtained, but if treatment is to be economically worthwhile it should be commenced early in the outbreak. It may be added to the mash or to the drinking water, but as affected birds go off their feed but drink more, the latter is the method of choice. Two ounces of a 16 per cent. solution of sulphamezathine are added to each gallon of drinking water, all other sources of drinking water being removed. In the original experiments the medicated water was given for seven days, but it appears likely that treatment for four days is long enough. Good results have been obtained by giving 2 ounces of the 16 per cent. solution per gallon of drinking water for the first day and 1 ounce to the gallon for the remaining three days.



Stages in the Life History of Caecal Coccidiosis.

The average amount of medicated water consumed over a four-day period is shown below (W. G. Fischel, *N. Zealand J. of Agriculture*, December, 1946).

Age (weeks).	*Average water consumption. per* 100 *chicks in* 4 *days.*
1–2	2½ gallons.
2–3	3 gallons.
3–4	4½ gallons.
4–5	6 gallons.
5–6	8½ gallons.

CAUTION.—Sulphamezathine should not be given for more than seven days or it will produce harmful results. The medicated water should be given for preference in non-metallic vessels, and if metal containers are used they must be thoroughly smeared with vaseline.

Sulphapyrazine.—This drug, like sulphamezathine, is for use after an outbreak commences, and is used in the same manner at the rate of 0.1 per cent. in the drinking water (1 ounce to each 6¼ gallons of water). Results should be even more spectacular than with sulphamezathine, and even if continued for longer than seven days no ill-effects will be produced. Here again four days treatment probably will suffice, but as the drug is not available at present (1947) in Sydney nothing definite can be stated in this respect. At present the cost is prohibitive, being about five times that of sulphamezathine.

Sulphamerazine.—This may be used as a treatment, 1 per cent. being fed in the mash (all-mash, dry-mash) for seven days. Good results can be expected, but probably not as good as with sulphapyrazine or sulphamezathine. Experimentally 0.25 per cent in the mash (4 ounces per 100 lb. feed) has given good results as a prophylactic measure, and also as a treatment if given early in the disease. Used prophylactically some loss in weight gains can be expected.

Plant Diseases—*continued from page* 491.

is large, there is reason to believe that the fungus increases the nutrient-absorbing capacity of the roots. In the case of citrus and other fruit crops, the number of connections between the internal fungus and the soil environment is too small to benefit the plant, or to replace a root hair system. If any benefit accrues to the host plant, it is probably as the result of decomposition of soil organic matter by the mycorrhizal fungus rendering material available to the root in the same way that non-mycorrhizal fungi in the soil decompose plant remains to simple assimilable compounds.

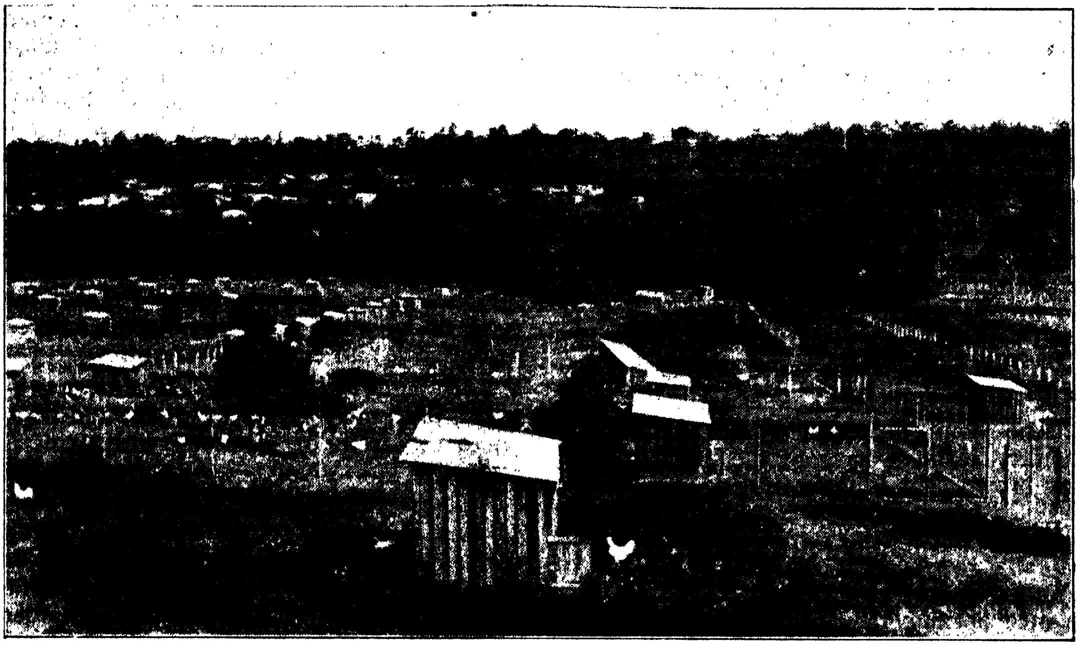
There is evidence that the controlled parasitism may under some circumstances be broken down. Reed and Fremont in California found that in citrus trees which had no fertilizer for seven years, the roots had little power to resist invasion or to digest the older mycelium. Presumably this would contribute to the general impoverishment of such trees. Under ordinary orchard management, such a stage would never be reached.

The fungus has not so far been cultivated artificially, but appears to be present in all natural soils.

Seedlings grown in steam-sterilized soil have no mycorrhiza. If the soil is inoculated with a little unsterilized soil, mycorrhiza develops at once. No difference has been noted in the growth of inoculated and non-inoculated seedlings under glasshouse conditions.

Feeding Notes—*continued from page* 494.

Laying Stock.—Where green feed is in short supply, but birds are receiving 4 lb. per hundred birds per day, no supplements are necessary. If not receiving this amount of green feed or green feed is absent, use fish oils. Where bright yolk colour is wanted, add lucerne meal or yellow maize to the ration. Note that lucerne meal, although a good source of riboflavin and yolk-colouring material, is not a reliable source of vitamin A, as the carotene, from which vitamin A is formed in the body, is steadily destroyed when the green feed is cut and allowed to dry.



Portion of the Poultry Experiment Farm, Seven Hills.

POULTRY NOTES

THE EXPORT SEASON

E. HADLINGTON, Principal Livestock Officer (Poultry).

ACCORDING to statements recently published by the Egg Marketing Board there has been, so far this season, little, if any, improvement in the number and quality of eggs forwarded to the Board for export. Such a fact, at a time when conditions are conducive to the production of good quality eggs, does not suggest much hope for the production of quality export eggs later in the season when the hot weather renders more difficult the maintenance of quality.

The position disclosed is most unsatisfactory and calls for redoubled effort on the part of all concerned to bring about an improvement not only in order to supply Britain with an increased quantity of eggs which are so sorely needed, but also to establish a reputation on that market for high quality eggs and thus assist the industry here to retain a full share of the trade in eggs when present agreements expire.

Some of the main items in the handling of eggs on the farm to ensure better quality were dealt with in these Notes in March and July, but it is realised that the extra care required adds to the cost of production, and until some inducement is given by way of an increased price for eggs of export quality it cannot be expected that all the necessary measures for improving quality will be adopted.

To put into practice even a few of the simple measures for preventing the soiling of eggs, *i.e.*, keeping the houses and nests clean with plenty of dry litter on the floors and the collecting of eggs, say three times daily, involves the farmer in a considerable amount of extra expense in labour and material.

While most farmers are anxious to do everything possible to assist in the production of high quality eggs, the economic aspect has to be considered, and with mounting costs of poultry foodstuffs no extra burdens can be borne. However, in their

own interests producers are urged to adopt every means possible for maintaining the quality of eggs, particularly by not washing those intended for export, but there would be no objection to removing small patches of dirt with sandpaper.

White versus Brown Eggs.

The ban on washed eggs for export raises the question as to whether more attention should not, in the future, be given to breeds which lay brown eggs, as it is well known that a much smaller proportion of brown eggs become soiled than is the case with white eggs.

The main objection which commercial poultry farmers have to the breeds which lay brown eggs is their tendency to become broody, which entails a considerable amount of work during the summer. However, if suitable provision is made to handle them systematically by having crates with a slatted bottom, they do not present such a difficult problem.

There are other advantages which the heavy breeds possess which the light breeds do not, and these to a large extent offset the good points of the light breeds. The heavy breeds usually lay more consistently during the autumn, as they are less susceptible to moulting at that time than the light breeds, and they realise higher prices in the market for both hens and cockerels.

More extensive breeding of Australorps, Langshans and Rhode Island Reds would not only result in the production of more clean eggs, but would also provide a greater volume of suitable table birds.

Crating of Live Fowls, etc., for Export.

THE Comptroller of Customs has advised that the following conditions are to be observed with regard to the crating of live fowls, ducks, turkeys and geese:—

For the crating of fowls, ducks, geese and turkeys for shipment overseas, it is desirable that the coops be constructed of wood and the front be covered either with wire netting or slatted battens, the latter preferred.

The top of crates may be either sloping or flat, but must be watertight. The floor should be of wood, and should be covered with straw or dry grass, and provision must be made for cleaning by attaching a hinged flap (wide enough to permit of cleaning, but should not be so large as to allow the birds to escape) along the front of the coop near the floor.

Where the birds have to travel through the tropics, ample ventilation should be provided for by leaving an aperture of about 2 inches along the back near the top of the coop, or by holes 1 inch in diameter bored in the back and ends near the top.

Food and water vessels should be provided, preferably of a type which will hang on to the front of the coop with a metal strap.

The minimum sizes desirable for the various classes of birds mentioned being despatched on a journey of seven days or over are as under, but reasonable latitude may be allowed if the journey is under seven days, as to New Zealand and Lord Howe Island.

Fowls.

For single birds the coop should have a floor space of 3 square feet (2 feet x 1 foot 6 inches) and a minimum height of 2 feet.

Where more than one bird and up to four are being sent, not less than 2 square feet of floor space per bird should be allowed, and not more than one male bird should be put in one compartment. The minimum height should be 2 feet.

A maximum of not more than eight adult female fowls should be placed in the one compartment, and in such cases they should have a minimum floor space of 1½ square feet per bird and a height of 2 feet.

Where adult male fowls are being sent, only one bird is allowed in one compartment with a minimum floor space of 3 square feet and a height of 2 feet.

Ducks.

Coops should be constructed as for fowls. An allowance of 3 square feet should be made for single birds or 2 square feet per bird should be provided where more than one bird is in the same compartment.

Drakes.

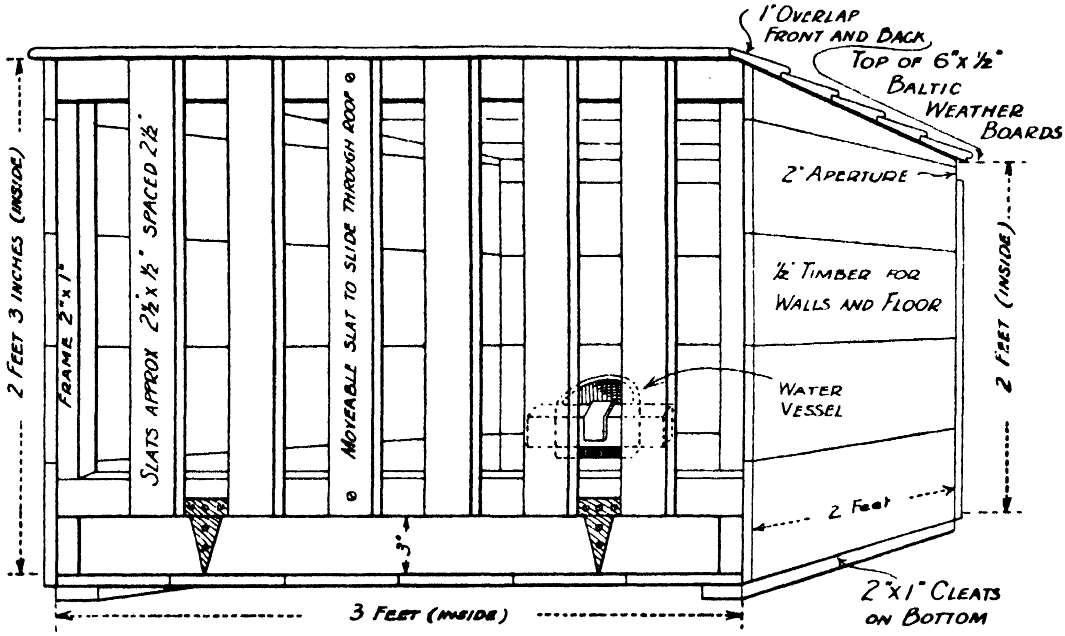
Only one bird is allowed to each compartment, and floor space of 3 square feet should be provided.

Geese.

Coops should be constructed as for fowls, with an allowance of 5 square feet of floor space where single birds are being exported, or 3 square feet per bird where more than one bird is in the same compartment. The minimum height should be 2 feet 3 inches.

Turkey Hens.

Coops should be constructed in the same manner as for fowls, except that the minimum height should be 2 feet 6 inches. Where single birds are being sent, floor space allowed should be not less than 6 square feet. Where more than one bird is being sent in the same compartment the minimum floor space should be 4 square feet per bird.



Coop for Shipping Fowls Overseas.

Turkeys (Gobblers).

Coops should be built in the same manner as for fowls, except that the minimum height should be 3 feet. About 9½ square feet of floor space (3 feet 9 inches x 2 feet 6 inches) should be allowed, and only one bird to a compartment.

Lantana Leaf Bug Found on the North Coast.

THE lantana leaf bug (*Teleonemia scrupulosa*) was introduced into Australia about 1936 because it was considered to be of some value in controlling lantana. It was liberated in a number of places on the North Coast of New South Wales and in Queensland between the years 1936 and 1939.

It is of interest to record that this insect has recently been found at Cudgen, on the Tweed River, and at Bungabbee State Forest, near Casino.

For several years after being liberated no trace of it could be found in New South Wales, and it was generally considered that the climatic conditions in this State were unsuitable for its establishment. The view was supported by the fact that it quickly became established in the higher rainfall and more tropical areas of North Queensland. It is now widespread in southern Queensland also.

While the appearance of this bug on the North Coast will be watched with interest, there does not seem to be any reasonable hope that it will efficiently control lantana. Should it become widespread, I think the most we can hope for is that the damage caused to the plant by the bug will prevent a certain amount of seeding.—T. McCARTHY, Chief Entomologist.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	188
Hawkesbury Agricultural College, Richmond (Jerseys)	106
Hicks Bros., "Meryla," Culcairn	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
New England Experiment Farm, Glen Innes (Jerseys)	49
Mutton, T, "Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	100
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	24
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	37
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
Scott, A. W., "Milong," Young (Aberdeen-Angus)	474*
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Wagga Experiment Farm, Wagga (Jerseys)	47
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
New England University College, Armidale	25
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	100	30/8/47
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	29	15/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	5	23/7/47
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
Navua Stud Farm, Grose Wold, via Richmond (Jerseys)	120	8/10/47
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	259	20/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Riverina Welfare Farm, Yanco (Jerseys)	113	16/8/47
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Wallaga Lake Aboriginal Station	19	29/4/47
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	119	20/4/48
Yanco Agricultural High School, Yanco	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brodie, A. D., Naman Park, Menangle	49	14/4/48
Brookfield Afforestation Camp, Mannus	197	12/7/47
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N. L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	57	2/11/47
MacNamara, B., "Mount View," Cessnock	58	16/5/48
Marist Bros. College, Campbelltown	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville	21	8/8/46
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital	24	2/9/47
St. Ignatius' College, Riverview	24	7/7/47
St. John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree	53	10/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia	171	14/4/49

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Citrus Bud Mite—*continued from page 476.*

Injury consists principally in the destruction of leaf axil bud tissue, causing weakening and sometimes destruction of these buds. Production of weak shoots from adventitious buds developing as a result of destruction of the primary buds, and contortion of leaf and shoot growth, flowers, and young fruits, also occur. A less important type of injury, showing up as a blackening of the tissue, occurs where mites feed beneath the calyx lobes of lemons or where young fruits press against each other in clusters.

The mites are microscopic, sausage-shaped, cream to pearly white in colour and lay relatively large globular white eggs amongst the tender tissue on which they are feeding.

Hot, dry conditions were observed to have an important influence on mites and eggs.

Distinctive characteristics, serving to distinguish citrus bud mite injury from minor element deficiency troubles such as exanthema or zinc deficiency, are given.

White oil and sulphur materials are effective against bud mites, but the effects of the latter are more permanent. These materials are more effective than D.D.T. emulsions, or H.C.N. fumigation.

A system of "skeleton pruning" developed in the Gosford district to rejuvenate unproductive citrus trees is of special advantage in rehabilitating trees heavily infested with bud mite.

Acknowledgment.

The author is greatly indebted to Dr. A. M. Boyce, Associate Entomologist, Citrus Experiment Station, University California, for his informative personal communications on the status of the citrus bud mite problem in California, and for the series of excellent photographs, some of which have been used to illustrate this article.

Acknowledgment is also made of the assistance afforded by Mr. Roy Wood, at that time Fruit Inspector in the Department of Agriculture, in some of the experimental work in connection with the citrus bud mite problem.

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SEVERAL changes have been made in the titles of certain of the Imperial Agricultural Bureaux. The Imperial Bureau of Pastures and Forage Crops has become the Imperial Bureau of Pastures and Field Crops, and the Imperial Parasite Service has become Imperial Bureau of Biological Control.

THE AGRICULTURAL GAZETTE FOR OCTOBER, 1947.

This Issue Contains:—

Agricultural Shows

Do an Excellent Job.

RECORD entries and record attendances have rewarded agricultural show societies ("Royals" and locals) for their efforts in staging shows this year, after, in most cases, a break of several years. Already this year Sydney, Brisbane, Adelaide and Melbourne have held their "Royal Shows", and a record number of societies in New South Wales have either staged shows, or are billed to hold them before the close of 1947.

With so much emphasis on the quantity aspect of production during the war years and since—an emphasis which is still dominant because of continued world food shortages—it is heartening to know that the desire to maintain quality is still strong, perhaps stronger than ever, if the record entries of stock and produce at this year's shows are a true indication. During the years of frenzied effort for maximum production of foodstuffs (years when quality counted for little) our primary producers never lost their sense of perspective, and apparently preserved with excellent judgment all that would enable them to maintain highest quality in stock and crops. That is fully evidenced by the excellence of exhibits entered in this year's shows.

Record attendances at those shows, particularly at the "Royals," testify to the consuming public's continued appreciation of primary producers' efforts. Consumers, by attending agricultural displays, are enlightened as to the real meaning of quality in products, which subsequently they are certain to demand, with benefit to themselves and to the primary industries.

In many ways, agricultural shows are doing an excellent job for local and national agriculture. They constitute the most telling single advertisement possible for the products of the soil. If Australia could similarly advertise her primary products to the world it would greatly enhance world-regard for our export products.

Further, shows afford producers of quality stock and crops an opportunity to compare the results of their efforts with those of others equally keen to produce only the best. No one will begrudge the prize-winners the advertising value of their successes—an advertisement which they would be unbusinesslike not to capitalise.

It is the whole show, however, which counts most. At the "Royals," for instance, where competition is on an Australian-wide basis, the rate of progress in developing the nation's stock and crops tends to be set by the most progressive farmers and stock breeders, whether they be from New South

Wales, Victoria, South Australia or any other State.

Another valuable aspect of agricultural shows is that the products exhibited can be accepted as a measure of the worth of the findings of agricultural research. Application of the results of research has played no small part in attaining the standard of excellence in agricultural show exhibits. In other words, this high standard is within the reach of practically every primary producer. Evidence of a growing realisation of that fact is supplied by increasing public interest in displays featured at agricultural shows (especially at the "Royal Shows") by Departments of Agriculture. These displays tell what agricultural research has achieved, how it may be applied and how the services of those Departments may be availed of. Organising societies are, naturally, anxious to see these Departmental displays maintained at a high standard, as they tell the story behind the wealth of primary produce featured in the nation's "shop windows"—the agricultural shows.

Departmental Appointments.

SEVERAL appointments and promotions of Department of Agriculture officers were announced during the month by Hon. E. H. Graham, M.L.A., Minister for Agriculture.

Division of Animal Industry.

New Director of Veterinary Research.—Mr. Grahame Edgar has been appointed Director of Veterinary Research, in charge of Glenfield Veterinary Research Station. He succeeds Mr. W. L. Hindmarsh, recently appointed Chief of the Division of Animal Industry, N.S.W. Department of Agriculture.

Mr. Edgar, a graduate in veterinary science (Sydney University), gained early experience as a Stock Inspector, and in 1927 was appointed McGarvie Smith Research Scholar. Later promotions included appointment, in 1929, as Veterinary Research Officer at Glenfield Station, and, in 1936, as Senior Veterinary Research Officer. He has established a high reputation as a bacteriologist and research worker, and has given special attention to what are known as soil infections in livestock, and to toxaemic jaundice in sheep.

District Veterinary Officer (County of Cumberland).—Mr. R. M. Watts, B.V.Sc., has been appointed District Veterinary Officer for the County of Cumberland, with headquarters at Sydney. Creation of this position has been found necessary to cope with increased demand for the services of such an officer in this section of the State. It will also provide an additional safeguard to the livestock industry against outbreaks of disease.

Division of Plant Industry.

Principal Agronomist Appointed.—Mr. Harold Bartlett has been appointed Principal Agronomist in the Division of Plant Industry. In this capacity he will plan and supervise the extension activities of the Department's twenty-eight district agronomists located throughout the State, spreading knowledge of modern farming methods based on the results of research.

Mr. Bartlett holds the Hawkesbury Agricultural College Diploma in Agriculture. He joined the Department's staff in 1910 and was stationed on several Experiment Farms and later at Hawkesbury College. After four years in the A.I.F. he was District Agricultural Instructor in several parts of the State. In 1938 he was appointed Senior Experimentalist, in charge of experiment and research work at the Department's Experiment Farms, and in 1941 he became Cereal Specialist. During the latter part of the war Mr. Bartlett was State Controller of Agricultural Machinery.

Division of Horticulture.

Special Fruit Officers Appointed.—Mr. R. J. Benton has been appointed Special Fruit Officer (Extension); Mr. R. G. S. Kebby, Special Fruit Officer (Citrus); Mr. J. A. Ballantyne to the newly-created position of Special Fruit Officer (Pome Fruits); and Mr. J. D. Bryden, Special Fruit Officer (Stone Fruits).

The re-organisation and enlargement of the staff of this Division will assist to cope with the fruit industry's ever-growing demand for more intensive research and effective dissemination of the knowledge thus gained.

Division of Information and Extension Services.

Agricultural Bureau Organiser Appointed.—Mr. H. Parry Brown has been appointed Organiser of the Agricultural Bureau.

Mr. Parry Brown, who is a graduate in Arts and in Agricultural Science, entered the Department in 1929 as a trainee in Agricultural Science. From 1933 to 1941 he worked as a Plant Pathologist, specialising in stone and pome fruit diseases.

In 1942 he was seconded to the Division of Information and Extension Services for special work in connection with War Agricultural Committees, and in March, 1944, was appointed Acting Organiser of the Agricultural Bureau.

Mr. Brown is President of the Sydney University Agricultural Graduates' Association, and in 1946 was President of the New South Wales Branch of the Australian Institute of Agricultural Science.

A NEW DEVELOPMENT IN LIMING

Crusher to Paddock Service.

W. D. HARDY,
B.Sc. Agr., H.D.A.,
Agronomist.

Fig. 1.—Lime Spreader in Action, Top-dressing Pasture at 1 ton per acre.

LIMING is a valuable adjunct to many fertilising or manuring programmes, but it has always been considered, in the past, to be too costly under Australian conditions for most types of farming. However, a "crusher to paddock service," which has recently been put into operation in the Moss Vale district, will help to reduce the cost of liming.

Briefly, the service, which, it is understood, is the first one to come into operation in Australia, is the spreading of ground carbonate of lime by special machinery, without any handling being necessary by the landowner. This type of spreading has been in operation in United States of America and Britain for some time; in fact it is understood that the bulk of the lime now used in America is applied by this method.

The comparative costs of this new method and the old one are discussed in this article, and a description given of the machinery used in the crusher to paddock operation.

Study of the economics of the agricultural industries in this State has shown that only certain types of farming, namely dairying, some types of grazing, vegetable-growing, horticulture, and possibly fruit-growing, could afford the cost of liming at present costs.

To help conserve soil fertility, to produce better stock, to produce high yields from dairy stock in particular, to produce heavier yields of health-giving vegetables, lime should be more universally used in the higher rainfall areas of New South Wales. It is anticipated that the use of the direct spreading service will open up greater possibilities for its use along the coast and near tableland areas, such as Moss Vale, Dorrigo, etc., but the cost will still be high—possibly too high to allow of the use of lime under many conditions—so that serious consideration must still be given to ways and means of producing a cheaper article.

The Benefits of Liming.

Organic matter and artificial fertilisers are important in the maintenance of soil fertility, but a proper balance cannot be maintained between plant growth and fertility unless the soil is in a "sweet" condition—in other words, unless the acidity is relatively low.

Lime benefits soil in many ways. It binds sandy soils, making them more retentive of water; it loosens clay soils, making them readily penetrable by roots; it neutralizes acidity and stimulates the proper decomposition of organic matter; it promotes favourable bacterial activity which renders plant foods more readily available; and it increases the efficiency of manures and fertilisers when applied to the soil. Plants also absorb lime to build up their own tissues.

A high acidity in soil seriously affects the fate of superphosphate, in that high acidity renders the phosphate less available to plants. It has been shown that phosphates are most readily available to plants when the acidity ranges from pH 5.5 to pH 7.5—that is, from a relatively low acid condition, namely, pH 5.5, to an alkaline condition, namely, pH 7.5.

Most soils in the areas of New South Wales where liming is considered necessary are of a high order of acidity, ranging usually from pH 4.5 to pH 5.5, averaging about pH 5.0. Thus it can readily be seen that unless this condition is corrected by liming, the greatest benefits cannot be derived from the use of superphosphate and other artificial fertilizers.

Again, useful bacteria which break down organic matter, and thus render it available for plant growth, thrive between pH 5.5 and pH 7.5; consequently liming should be an integral part of any organic farming project. Liming, artificial fertilising and organic farming go hand in hand.

The principal reasons why liming has not been more widely practised in the past are as follows:—

(*a*) The high cost;

(*b*) the use of commercial fertilizers (for example, superphosphate) is cheaper, and gives an apparently satisfactory return in a short time;

(*c*) immediate results of liming cannot be observed; and

(*d*) the functions and value of lime are not understood.

In connection with this last point, it is of interest that 30 to 35 lb. of calcium are required for body maintenance of an average dairy cow; 10 to 15 lb. for the development of the calf, and about 25 lb. for each 5,000 lb. (500 gallons) of milk she produces; that is, 65 to 75 lb. per annum.

Lime is lost from the soil by the sale of animal and crop products, soil erosion, and leaching in drainage water. It is estimated that in an average soil the equivalent of 6 to 7 cwt. ground carbonate of lime is lost per annum. On this basis, an application of ground carbonate of lime at the rate of 7 cwt. per annum or 1 ton every three years would be sufficient for normal crop and pasture requirements.

The spreading machinery as used in the Moss Vale district is adapted for spreading lime at the rate of from 5 cwt. to 1½ tons per acre, but in view of the economics of the process, farmers would be well advised to apply a heavier rate in one application rather than a light rate at more frequent intervals.

Comparative Costs of New and Old Liming Methods.

An idea of the saving in cost by utilising the "crusher to paddock" service is gained by a comparison of costs incurred by two farmers, whose properties are side by side, at Avoca, 10 miles from Moss Vale or 14 miles from the crushing plant.

Mr. A. R. Monaghan had 12 tons applied by the spreader, whilst Mr. C. Trotter spread 7 tons himself.

COSTS.

Mr. Monaghan (14 miles from works)—

12 tons, spread on land, cost £25 12s. = £2 2s. 8d. per ton.

Mr. Trotter—

Lime—

7 tons @ £2 5s. (ex. store Moss Vale).
Less 2s. for cash.
Less 5s. ton for bags when returned = £1 18s. per ton.

Cartage—

(Store to property) £2 = 5s. 8½d. per ton.

Spreading—

Labour @ 25s. per day (It took Mr. Trotter 1½ days to spread 7 tons) = £1 17s. 6d.

Horse costs @ 5s. per day = 7s. 6d.

Depreciation on spreader = 2s.

£2 6s. od.
or 6s. 7d. per ton.

Total costs = £2 10s. 3½d. per ton.

The difference in the cost on these two properties is 7s. 7½d. per ton, in favour of Mr. Monaghan.

Apart from the 7s. 7½d. per ton extra charge, Mr. Trotter had the added expense of collecting and returning the bags to Moss Vale.

Another interesting comparison of costs is possible in the instance of a Moss Vale grazier who applied lime by both old and new methods.

In the first instance, 7 tons of lime was applied by his own means, the actual cost being as follows:—

	£	s.	d.
Lime.			
7 tons at £2 2s. per ton net, (including cartage to property)	14	14	0
Spreading.			
Labour (10 hours to spread)	1	10	0
Tractor—10 hours at 5s. ..	2	10	0
Depreciation on spreader ..		2	0
	£18	16	0

Price per ton, £2 13s. 8½d.

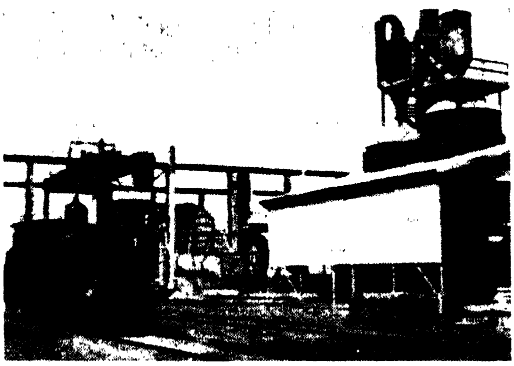

Fig. 2.—General View of the Plant with Storage Bins and Loading Docks in Foreground.

Subsequently this landowner had 107 tons applied by the new method, the cost being £1 19s. 0d. per ton, less 10 per cent. for 100-ton lots (distance from works 8-9 miles). The total cost was £187 15s 9d., and the price per ton, £1 15s. 1½d.

The saving resulting from using the direct spreading service was, in this case, 18s. 7d. per ton.

THE CRUSHER TO PADDOCK SERVICE.

The various operations entailed in this new service are as follows:—

Quarrying the Limestone.

Supplies of limestone are obtained from the extensive deposits south of Marulan. It is estimated that the deposits contain 400 million tons of high-grade limestone.

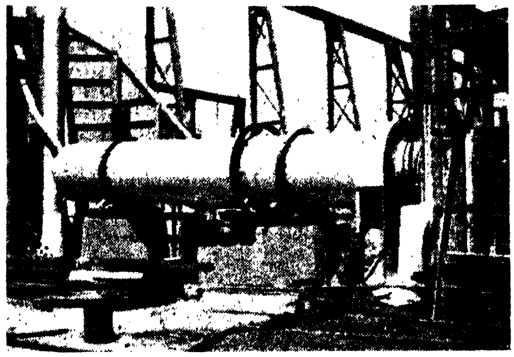

Fig. 3.—Rotary Drier with Fire Box in Right Foreground.

After quarrying, the limestone is loaded by electric shovel into motor lorries, which transport it to a great gyratory crusher. The crushed limestone is elevated by belt conveyors to the screens, which separate the product into four different size ranges—sizes which at this stage are too coarse for agricultural use.

In the production of agricultural lime, limestone is selected to give the highest purity possible. It is interesting to note that these quarries are capable of supplying, on a commercial scale, a grade of approximately 95 per cent. purity.

The crushed limestone is railed a distance of 36 miles from the quarries, to Berrima, where the agricultural lime works are situated.

Crushing and Pulverising.

Upon arrival at Berrima the limestone is unloaded from the trucks by means of an overhead crane equipped with a 3-ton capacity grab, which places the limestone in a 35-ton receiving hopper (see Fig. 2).

Fig. 4.—Ball Mill, showing Driving Motors in Foreground.

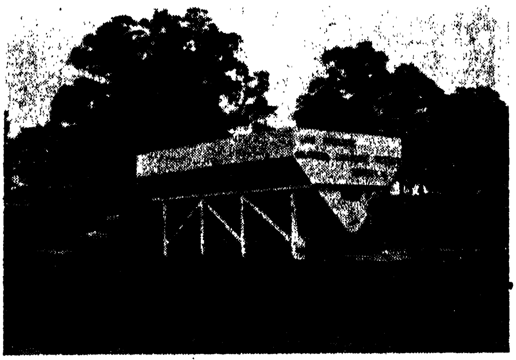

Fig. 5.—An 8-ton Truck Lime Spreader.

From this hopper the limestone is fed to a small gyratory crusher, which reduces the size from 5-inch maximum lumps to 1½ inch maximum. This crushed product is then elevated to a 35 feet long by 6 feet diameter rotary drier (see Fig. 3). The drier enables the plant to be kept in operation in all weathers, and ensures that the product flows freely in the spreading machines.

The drum of the drier rotates at about 3 revolutions per minute, and has in its interior a series of lifting vanes, which, combined with the slight inclination of the axis of the drier, causes the limestone to progress slowly through the drum. At the same time the hot gases from a coal fire are passed through the drum in the opposite direction.

After drying the limestone passes to the pulveriser, the main unit of which is a 7 feet diameter by 8 feet long ball mill. The mill is lined with hard steel plates about 3 inches thick and is charged with 10 tons of forged steel balls (see Fig. 4). As the mill is rotated at 22 revolutions per minute, the balls are being alternately lifted and dropped, pulverising the limestone to a fine powder.

The ball mill is of the continuous type, the feed being introduced through a hollow trunnion at one end, and pulverised limestone being discharged through a diaphragm at the other. A revolving screen at the discharge end rejects any oversize lumps or tramp iron, etc., which may cause damage to bagging or spreading machines.

The mill is capable of grinding 10 tons of limestone per hour to a fineness such that all will pass through a sieve having 20 meshes per lineal inch.

Loading into Spreader Trucks.

From the ball mill the ground material is elevated into a 50-ton storage bin. As the material is dropping into this bin, it is subjected to the action of an air stream, which separates out a small proportion of the finer particles, and conveys them to a cyclone dust catcher, from which the dust is deposited into a 35-ton bin. The bulk of this finer material would pass through a 60 mesh sieve, and is used largely in the manufacture of stock foods and licks. It is also in demand for chemical purposes, and as a filler for bituminous products.

The product from the main storage bin can be loaded either in bulk direct into the spreader trucks, or, by passing through an automatic bagging machine, into multi-walled, sealed paper bags. Thus a farmer may buy his lime in bags and spread it himself, or he may eliminate the bagging process and have the lime spread direct on to his land by means of the special spreaders.

Fig. 6.—Rear View of Spreader.

The distributor disc is obscured by the fan-shaped deflector, which prevents a cloud of fine dust from rising into the air.

Two spreader trucks are at present in operation—one of 4 tons capacity and one of 8 tons. The trucks are similar in principle. The following description applies to the 8-ton truck which is shown in Fig. 5.

The Spreader Trucks in Use.

The chassis is a standard petrol-engined "Ford-Thornton" model, with four-wheel drive which enables the truck to traverse cultivated land. The chassis carries an all-steel hopper body which is 12 feet long and 7 feet wide at the top.

The spreading mechanism, carried at the rear of the truck (Fig. 6) is driven from a propeller shaft, so that the weight of lime spread per acre does not vary with the road speed of the vehicle. The lime is discharged

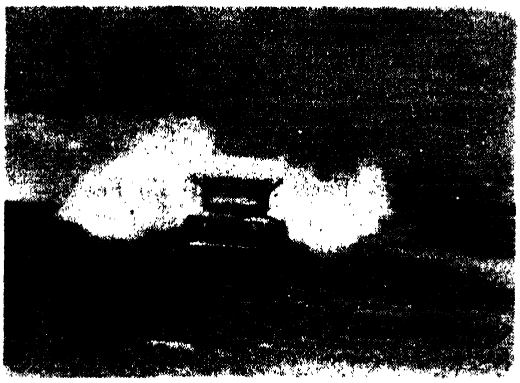

Fig. 7.—Front View of a Spreader at Work. Note the width of spread obtained.

from the hopper into a small conveyor which delivers it on to a rapidly revolving disc; the action of the disc, which is provided with suitable guards and deflectors, being to spread the lime in a semi-circular fashion over a width of 30 feet. The action is similar to that of an ordinary spinner type of fertiliser distributor (Fig. 6).

In the case of spreading machines which are now being used in England, the width of spread can be varied from 6 feet to 50 feet, whilst the rate of application can be varied from 10 cwt. to 5 tons per acre. Fig. 7, which shows a front view of a spreader at work, shows the width of spread obtained.

A gear box incorporated in the drive of the conveyor enables a wide range of spreading rates to be obtained, varying from 5 cwt. to 1½ tons per acre. The whole spreading mechanism can be stopped or started while the truck is in motion by means of a clutch operated from the cab.

Cost of Spreading.

The cost of spreading varies according to the distance from the works, but it has been found that the economical range should not exceed 40 to 50 miles. A price schedule has been prepared for all distances from 1 to 25 miles from the works to the entrance of the paddock to be spread, but the undermentioned examples will give an idea of costs:—

Up to 5 miles	..	35/0d. per ton.
9-10 miles	..	40/0d. per ton.
14-15 miles	..	43/4d. per ton.
19-20 miles	..	46/8d. per ton.
24-25 miles	..	50/0d. per ton.

A special discount of 10 per cent. is allowed to direct users for orders of 100 tons or over.

Trial runs have been made to the Metropolitan and South Coast areas, but in view of the distance, the cost of running the spreaders has been too great. However, with the setting up of bulk depots in these areas, the haulage costs will be considerably reduced.

The idea of applying lime by the use of these machines is rapidly spreading in the Moss Vale district. During the last twelve months, that is, since the inception of this service, 2,331 tons have been spread at an average rate of 15 cwt. per acre, which means that 3,108 acres have been treated. Greater quantities would have been spread except for interruptions caused by industrial and climatic troubles, but the amount that has already been applied will be a stimulus to production in the district.

AN important item to be watched in caring for **sick animals is that sufficient good water is available** for them to drink. A sick animal will often show a greater desire for water and will drink oftener than one that is well. Water has a cleansing effect on internal organs and assists the body to eliminate waste and toxic products. The elimination of these products in cases of sickness **is of great importance to the animal in overcoming its sickness.**

ANIMAL HUSBANDRY IN A CHANGING WORLD

MAX HENRY, B.V.Sc., M.R.C.V.S.*

"The old order changeth, yielding place to new,
And God fulfils himself in many ways
Lest one good custom should corrupt the world."

IT is doubtful if the poet intended his verse to be applied to livestock raising and management, but it could well be adopted to that end.

In the first place it is evident that change is no new thing, and secondly that change may be desirable. For proof that change may be undesirable, consider those changes in animal husbandry which led to the excessive destruction of timber, the overstocking of our western lands and the introduction of wrinkles to Merino sheep.

If the history of livestock raising and management is studied it will be clear that the methods adopted are always changing. The tempo of these changes waxes and wanes, but change goes on. At periods of great stress there is a tendency for change to be more marked and sought after; the periods of great wars are inevitably such periods, and men seek change because what is present is associated in their minds with dramatic and often undesirable happenings.

If we review the livestock situation in this country as it stood before the last war, and as it stands to-day, we shall find little change, but a foreshadowing of changes to come. None of these foreshadowed trends is new, but some represent an intensity of action which might not have occurred had the last war been avoided.

The Interest in Scientific Feeding.

It is interesting to note that many of our chief problems are still the same. It will, for instance, probably not be contested that one of the failures of our past has been the failure to adopt methods of feeding livestock apart from grazing. During the years between the two wars interest in the adoption of various methods of feeding was undoubtedly increasing, though on a somewhat empirical basis. The major change in our outlook now should be the utilisation of scientific knowledge of the value of different types of feed, and the building up of routine practices which are based on such knowledge. The close examination of the economical side of such methods should be a complementary step. We may see this exemplified in the present day work of the Division of Animal Industry of the Department of Agriculture, the Council for Scientific and Industrial Research and the University Veterinary School.

New Facts About Grain Feeds.

The war has also had the somewhat unexpected result of teaching us new facts as regards the value of certain grains. Everyone has, to some extent, been astonished at the degree to which wheat could be utilised to feed livestock of all descriptions. Incidentally we also learnt some new facts regarding its limitations, particularly when fed in excess to poultry. We have also had our attention turned to the grain sorghums, which seem likely to oust wheat to a large extent from our feeding practices. No doubt other examples could be mentioned, but these are referred to with the idea of illustrating our rather narrow outlook on feedstuffs.

Perhaps the influence of the war will do much to broaden our ideas on this point. If so, it will be a definite change in a changing world. Try and imagine the financial saving which would be effected if the majority of stockowners, when hand-feeding, based their practices on the economic use of a wide line of feeds. If we could see, combined with this, the widespread adoption of fodder conservation based on the idea of growing and storing feed on the farm on which it is to be used, then indeed would we see a changed world. It would be a world in which the idea of creating depots of

*Notes of an address given at the 1947 State Conference of the Agricultural Bureau of New South Wales. Mr. Henry recently retired from the position of Chief, Division of Animal Industry, Department of Agriculture.

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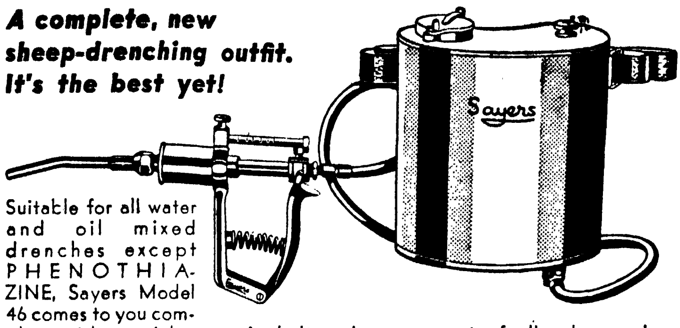

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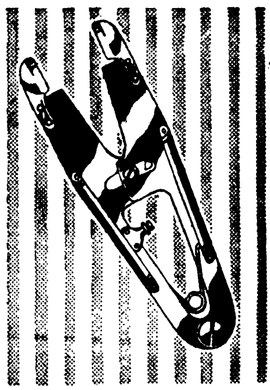

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fodder at so called strategic points would be scouted as futile. Also it would lead to the abolition of concession rates for fodder for starving stock on the railways. It is high time that people realised that this is an obsolete method of dealing with a tragic situation. Are we sufficiently in earnest about change to see in its true light the tragedy and horror of starving stock?

So we may foreshadow with some degree of confidence that feeding will assume a new aspect—as being the normal instead of the abnormal. No Government can bring about the change; it must arise from the stock-owners. What the various government departments must do is to carry out experimental work so that the stockowners may be able to secure unbiassed advice. A good deal has actually been done in this direction, but the work requires speeding up by the provision of facilities and enough scientifically-trained men. It must be plain to everyone that we are only at the beginning of our use of scientifically-trained men. These men quite rightly consider themselves worthy of something more than the low rate of remuneration at present deemed sufficient by their employers.

Breeding Trends.

Just as the question of feeding will be dealt with by a speeding up of present trends, so breeding will follow ideas already in being. There will certainly be less dependence on external appearance in the selection of stud stock. There will arise a demand that many dogmatic statements regarding the linking of external features with high production should be put to the proof. This would be comparatively easy with pigs, poultry and beef cattle, by no means easy with sheep and definitely difficult with dairy cattle; but it could be done, although it is unlikely to be done without Governmental experimentation. There is a wide field for experiment and investigation to be carried out on the experiment farms of the State Governments, and it would be more payable in the long run than the production of stud stock on the present lines, valuable though that work may be.

The private breeder can produce stud stock, but is unlikely to check the comparative value of features which assist him in securing sales.

Artificial Insemination.

There will arise a demand for the wider utilisation of the few really high class sires known to be capable of reproducing in their offspring, the inherited tendencies towards high production in any given species or breed. To a certain extent this will be brought about through artificial insemination, but there is no justification for assuming that practices now possible in such countries as Denmark and Great Britain are feasible under present conditions here. The relatively small size of the farms, the small numbers in the herds, the greater density of the veterinary population and the close association of practically all farmers with the co-operative movement as exists in Denmark, all influence the position.

Prospective Demand for Animal Products.

These changes in feeding and breeding principles are designed to secure maximum production at minimum cost. This intention can only be justified if we can see a demand for animal products in the future. Now during the last war one aspect of the value of animal products has been brought well to the fore. That is the production of what are known as the "protective foods;" milk, milk products and eggs are the products usually and rightly so referred to. There can be little doubt that the remarkable record put up by the English people in the last five to six years has been associated with the controlled distribution of milk. At the present time the lack of fats, particularly those of animal origin such as butter, lard and dripping, is the most serious defect in English rations.

It may well be that in a changed world the authorities will take active steps to ensure to all the population, adequate supplies of milk and animal fats. It may well come to be regarded as a national calamity if supplies of these foods have to be rationed in the big cities. Their supply will be a major weapon in health maintenance.

It will be a natural corollary that the foods produced shall be from healthy animals and handled under the best hygienic conditions.

Livestock and Soil Fertility.

We may safely anticipate that the increasing cost of producing food by improved feeding practices will draw attention to the

role of livestock in maintaining soil fertility and minimising soil erosion. You probably know that in Great Britain and Europe livestock are often kept primarily to produce manure to fertilise the fields. Our methods of animal husbandry have militated against the full use of this benefit. Even making due allowance for that fact, our failure to take any adequate steps to overcome the difficulty still persists.

Manure of animal and vegetable origin cannot be equalled by synthetic chemical fertilisers, simply because we do not know all the constitutents of natural manure requisite to the production of healthy plants. Moreover, when we do secure a more complete list, we may not be able to produce them all commercially. Without livestock our soils would deteriorate, though such change might be so gradual that no one generation would be in a position to judge the cause. Just as we do not know every constituent of this organic manure, so we do not yet know every item necessary for the food of animals or man—but we do know enough to be able to refer to the "protective" foods.

It will be seen from what has been said already that the dairy industry must have a high place in our general economy, but we know that at the present time the productivity of the living units—the cows—is far below the level which would be achieved by improved feeding and to a much less extent, by improvements in breeding practices. Economic pressure may in the changes to come, force the dairy farmer to secure his return from a small number of higher-producing units. Such a movement would be all to the good.

It will have been noted that in several directions reference has been made to the maintenance of livestock health. The subject is of importance not only from the economic side, but also from that of human health.

The Ratio of Veterinarians to Livestock Population.

To bring about the desired ends Australia will have to enlarge the activities of the veterinarian and bring the situation here into line with that in such countries as Denmark and Great Britain. In those countries, the ratio of veterinarians to livestock population is far higher than is the case here. The desired expansion is already taking place, but requires speeding up.

It appears certain that the necessary recognition of the farspread value of livestock to our national economy will result in increased attention to health. Whether the necessary services are to be provided through Governmental agencies only, or by the more flexible method of Governmental plus private practitioner agencies, only the future will know. Whichever it may be, it will be essential to watch that the training of these veterinarians should be kept on a high plane and a broad basis. Only with money can this be secured.

Nothing Revolutionary Will Occur.

One may summarise the situation then by saying that change will continue, probably at a more rapid rate than was the case prior to the last war, but that nothing revolutionary will occur because the fundamental principles of animal husbandry cannot alter.

I finish then, as I began, with a quotation, "There is no new thing under the sun."

Cattle Tick Eradication Campaign Deferred.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has announced that the tick eradication campaign which was to have commenced on 2nd January, 1948, has been postponed.

The Minister stated that graziers west of the Richmond Range, which area was to be the first to come under the eradication scheme, had made representations to him asking for deferment of the campaign because they had been unable to put their boundary and internal fences in good order.

At the last meeting of the Board of Tick Control a motion was carried recommending that the campaign be deferred for another twelve months.

The Minister regretted that under the existing circumstances no other decision was possible.

HAYMAKING

A Means of Conserving Fodder

That is Palatable and Nutritious.

(*Continued from page* 486.)

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

HAY still holds pride of place among methods of conserving fodder in this country, for use in times of shortage or drought. The purpose of this article, instalments of which have already appeared in the July and September issues, is to set out the value of hay in fodder conservation programmes, to describe the methods of growing, curing and storing suitable crops, and to discuss the influence of these methods on the resultant product. This third instalment deals with the building of stacks of sheaf hay.

Modern Methods of Stacking Sheaf Hay.

In those districts where wheat is cut and stacked prior to chaffing, and a high-class product is marketed, professional stack-builders are frequently employed, but there are many properties on which the farmer or his men could store a much better product than that commonly seen to-day, if they better understood the general principles of stack building and paid careful attention to the details of the construction work.

Stack building may appear very complicated to the novice, but it is not hard to become proficient in this task. The following description of the process is reprinted from an article published in this *Gazette*, by Mr. G. J. Firman, of Ganmain, a practical farmer with considerable experience in haymaking procedures :—

Location of the Stack.

In building a stack, the main consideration is that it should be built in such a manner that it will keep out the rain and resist weather damage. For this reason the location of the stack is important, and a good, dry, level position is required where there is no danger of water running under the stack. Also, it is advisable to place the stack where there is least danger of damage by the wind. Location near a good belt of timber often saves the stack from damage, and if the district is subject to westerly winds the stack is less likely to be damaged if placed with the end facing the west. Then, too, the stack should be placed where there is a minimum risk from fire.

Stacks are often built on a straddle (a platform on metal-capped posts) to give protection against damage by mice, and for the same reason a galvanised iron fence let into the ground is frequently erected around the stack. Such a fence should be 2 feet high and have a slight lean outwards. No cracks should be left, and bags, pitchforks and straws, by which mice may gain entrance to the stack, should not lean against the fence. If the stack is to be built on the ground, a good bed of straw or timber is necessary to prevent damage to the bottom layer of sheaves.

Suitable Size and Shape.

For stacks ranging up to 50 tons capacity, 6 yards is wide enough, although for greater capacities the width should be increased to 7 yards. If the stack is too wide it will have a tendency to sink in the centre when it settles, causing the outside sheaves to dip in and allow water into the stack. A stack 6 yards wide and 14 yards long with 12 feet walls will hold approximately 40 to 45 tons of hay. In a stack of this height it will be found that 12 cubic yards of hay will weigh approximately 1 ton.

A stack with a "rolled" or round end, with the walls perpendicular and a hip roof with a ridge running along the central portion of the stack, is the easiest to build and is quite satisfactory.

Commencing to Build.

When commencing to build the stack, place the first row of sheaves around the

outside line with the butts out, then a second row inside these, but overlapping or "binding" them to a little below the band (see diagram on this page). Continue in a similar manner with further rows until the centre is filled.

The second layer is then placed on the first in a similar manner, and the building of the stack continued in this way until the height of the eave is reached. Care must be taken during this work that the centre of the stack does not become too high or too low; it should be from 1 to 2 feet higher

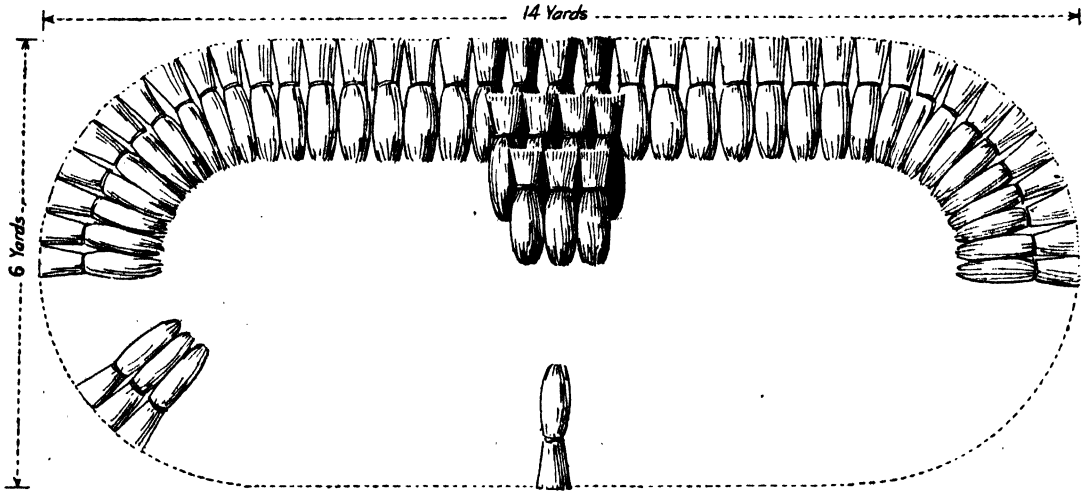

Diagram Showing Placing of the First Layer of Sheaves in the Stack.
The second row binds the first to a little below the band; the third binds the second and so on.

than the outside. To prevent it becoming higher than this during building, draw the "binders" (binding sheaves) back a little; that is, bind more lightly. If, on the other hand, the centre becomes hollow, the remedy is to bind a little fuller—or to put the binders further up. The outside rows of sheaves should have a slight dip outwards to ensure that water cannot run into the stack.

The walls should be kept perpendicular during building, as the weight of the hay settling will give the stack sufficient "spring"; that is, when the stack has settled, the walls will have sufficient outward slope. A "patter" (see illustration) is necessary to keep the walls straight and to pat in any sheaves which protrude too far. Such an implement can be made by fastening the end of a petrol case to a handle about 5 or 6 feet long.

Placing the Eaves.

When the walls have been raised to the height desired, the eave is built by placing the outside row of the next layer from 4 to 6 inches out beyond the line of the wall (see diagram of cross section on page 517). It is essential that these eave sheaves have a slight dip out, and, if necessary, extra filling must be placed in the centre to ensure the required outward dip of these sheaves. On the correct placing of these eave sheaves depends the success of failure of the roofing of the stack. The eave sheaves support the roofing sheaves and they must have the correct dip (not too great) and be well bound.

Building the Roof.

The eave is bound by placing the next row, butts out, to the band of the eave sheaves; then that row is bound more lightly and the layer continued to the centre. The next layer is commenced by placing the outside row, butts out, about 2 to 4 inches in from the eave binders, and this layer is continued in to the centre in a similar manner to the previous layer. If the hay is of great length, a third layer above the eave and placed similarly to the other two would be necessary to give the roof sheaves sufficient pitch, but in most cases two layers suffice.

The roof is then commenced by placing the first roof row with the butts resting on the edge of the eave sheaves (see cross section diagram on page 517). In a properly

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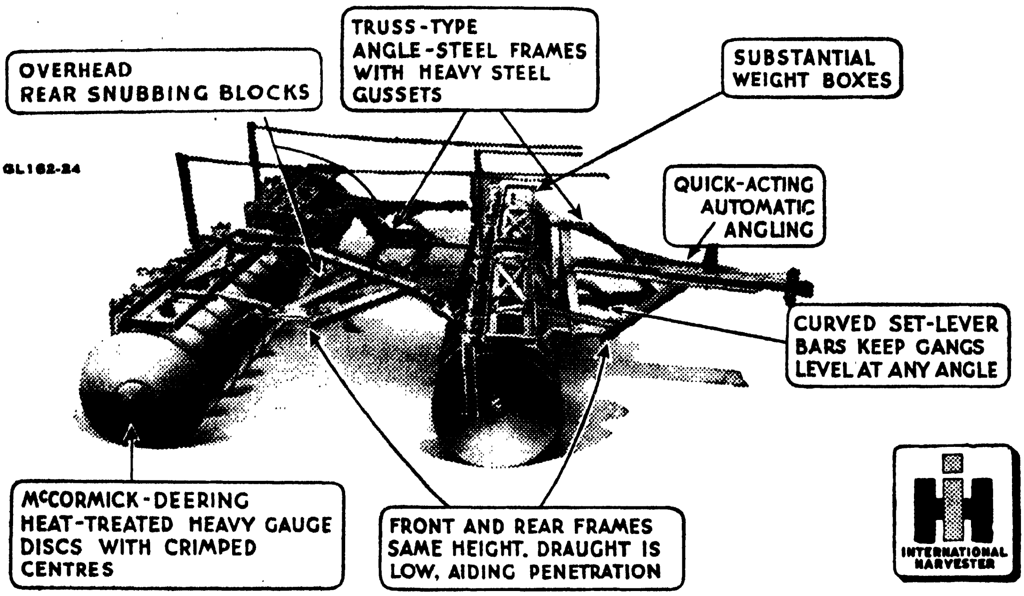

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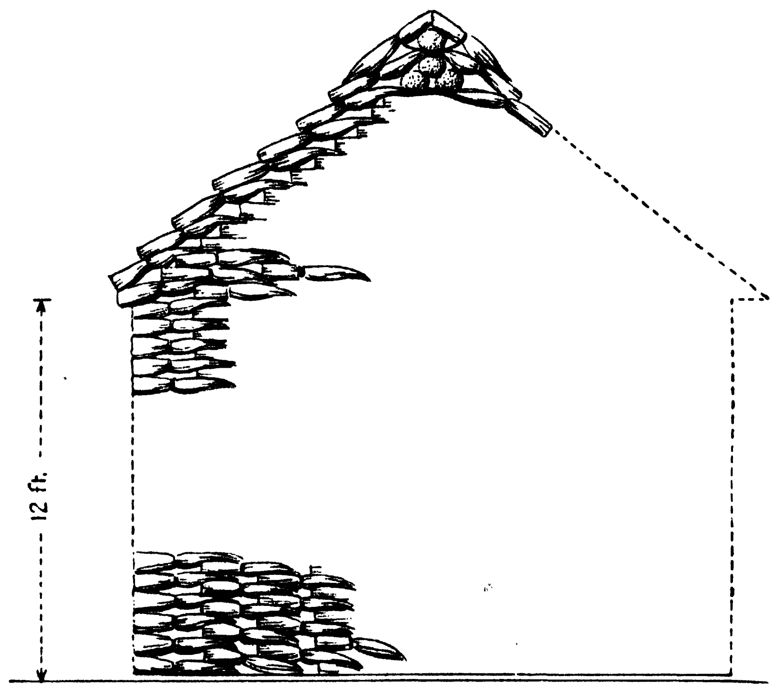
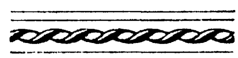


Diagrammatic Representation of Cross Section of Stack.

Showing method of binding sheaves and building eave and roof.



constructed stack the first row of roof sheaves covers the eave and prevents any water coming in contact with it.

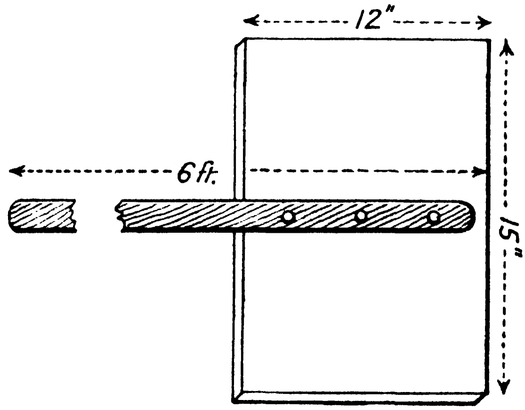
The first roof row is now bound by bending the heads inwards and just catching them under the butts of the outside row of the next layer of the stack, and this layer is continued to the centre. A further layer is now placed, the outside row being set just in from the row binding the roof row, and then a further roof row placed.

This building up of the stack and roof is continued until the roof sheaves meet across the top of the ridge along the centre of the stack. By this time the roof of the rounded end portion of the stack will be complete.

Care must be taken to see that the roof is not drawn in too quickly, as, irrespective of the pitch of the sheaves, the greater the amount of roof sheaf exposed, the greater will be the possibility of water soaking through the roof during a wet winter.

Capping the Stack.

A cap is commenced by placing side by side two rows of sheaves lengthways on the stack on top of the heads of the roofing sheaves, and then a third row of sheaves on top of these (see diagram on page 518). It is desirable to keep the top line of the stack as level as possible, and, to achieve this these sheaves are best placed in pairs, head to head and slightly overlapping. There is then sufficient filling to enable the placing of the final row of roof sheaves in position with the heads overlapping a little.



A "Patter" is Necessary to Keep the Walls Straight.

The cap sheaves are now put into place, butts upwards and heads hanging down the stack; it is necessary to tie these sheaves into position, and this is done by tying twine from the band of a sheaf on one side of the stack to the band of the corresponding sheaf on the opposite side. The work is

commenced at one end of the ridge (one or two sheaves being placed to cover the actual end), and continued to the centre; then commenced again at the other end, so as to finish in the centre.

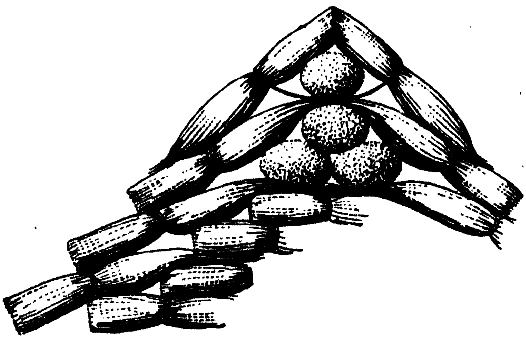


Diagram Showing Detail of Method of Capping Stack.
Cross section of ridge.

Some builders consider greater security is obtained by using long thatch pegs to secure the cap sheaves.

Organisation of the Labour.

Some organisation of the labour required for stackbuilding is necessary if the work is to proceed without loss of time. In the recognised hay districts, a team of six men is usually employed as follows:—one stacker, one sheaf turner, three carters (with three waggons), and one pitcher (who remains in the paddock). When the stack is built to a height (just before the eave is reached) sufficient to justify the use of the hay stage or platform, a man is placed on the platform (see illustration), and since the building from this stage onwards proceeds more slowly, one of the waggon men may be used for this work.

A Useful Hay Stage.

It is not difficult to construct a hay stage or platform. A useful size for the platform is 6 feet by 4 feet, and it should consist of 3 inch by 1 inch hardwood battens spaced 1 inch apart, bound across the ends with 3 inch by 1 inch hardwood battens, and carried on three 4 inch by 2 inch hardwood bearers; the platform is raised about 12 feet from the ground on 3 inch by 3 inch hardwood legs, which are braced with 3 inch by 1 inch or 3 inch by 2 inch hardwood (see diagrams on page 519). The legs have a spread at the base of approximately the dimensions of the platform.

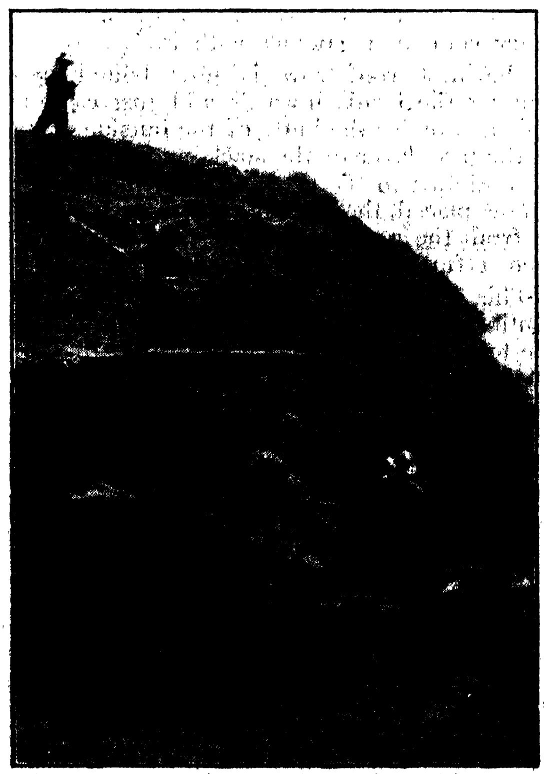
A better foothold is obtained if the platform is covered with an old wool bale, securely tacked down.

Protection of Stacks.

It is a self-evident fact, that if much expenditure has been incurred in growing, cutting, curing, carting and finally stacking a crop of hay, the product is well worth the expenditure of a little extra time and money on protective devices to safeguard it against damage.

The principal pests of hay are mice and birds. The activities of both of these vermin are not as great in hay which has been cut early and contains no grain, and mice are usually the worst offenders.

Two methods of excluding mice are usually adopted, either the stack is built on a straddle or alternatively a fence of flat galvanised iron can be built around a stack or group of stacks. Should mice be found in a stack protected in this way, an attempt should be made to get rid of them by poisoning. In any case haystacks should be fenced off to prevent damage by large stock.

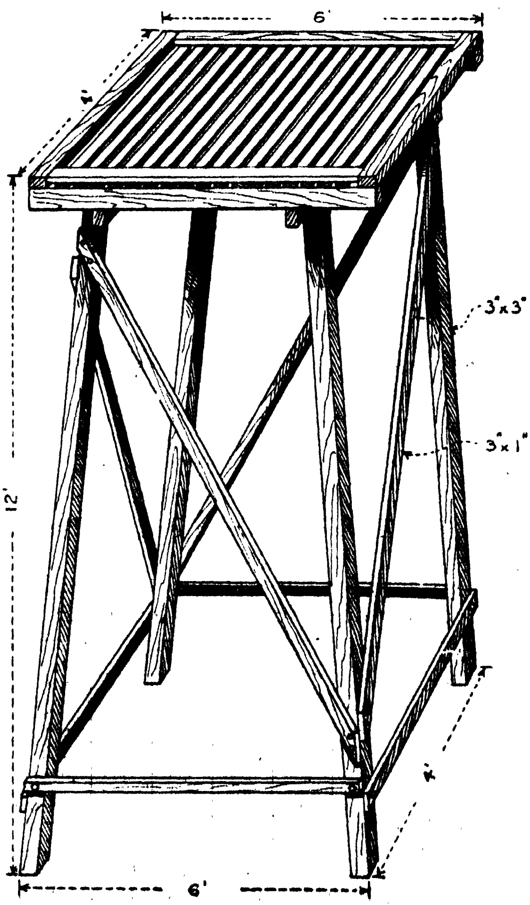


Hay Stage in Use.

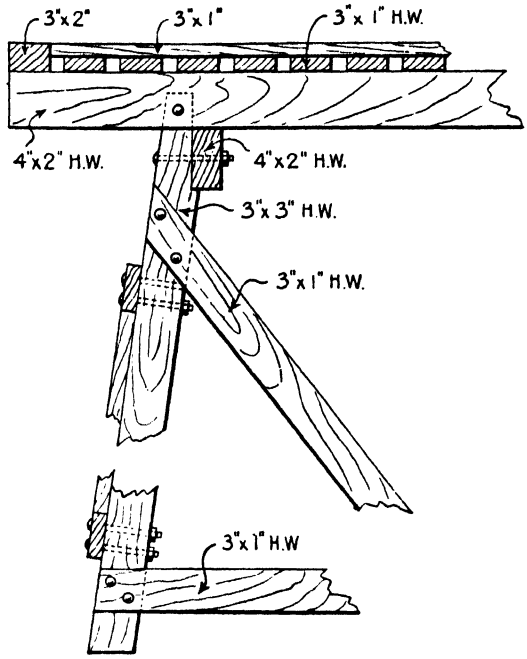
The second factor to be contended with is rain, and of course the best method of protecting against this element is to store the hay in a suitably-designed shed. Hay sheds should be constructed at least 15 feet high to the eaves and should, for preference, be enclosed on at least one end, the end selected being that from which rain most generally comes. Sheds are built in bays, and it is wise to build these bays about 12 feet wide so that there is ample room for the hay waggon to be driven right through the shed to facilitate unloading.

Information on the construction of hay sheds can be obtained on application from the Under Secretary, Department of Agriculture, Box 36A, G.P.O., Sydney.

Stacks in the open are protected by either thatching them, or by roofing with iron. Although the initial cost of a galvanised iron roof is high, the iron lasts for a long



Sketch Showing General Construction of Hay Stage, or Platform.



Sketch Showing In Detail Cross Section of Platform.

period and can be used several times. The art of thatching is not now very well known and understood in this State, but a leaflet describing the operation is available from the Department of Agriculture.

Determining the Quantity of Hay in a Stack.

Formulae for the exact calculation of the cubic capacity of a haystack are rather complicated for general use. These formulae are used because of the fact that a haystack is irregular in shape and dimensions. However, since the volume of hay required to make up a ton varies greatly with the age of the hay and its degree of settling, a formula which is not so accurate, but sufficient for practical purposes when the farmer desires to know how much fodder is available in both circular and rectangular stacks, is given below.

Cubic Content of a Circular Stack.

To determine the volume of a circular haystack, add together the circumference in feet measured round the base, and the circumference at the eaves, and multiply this figure by itself (i.e., "square" it). Multiply the product by the height in feet of the eaves above the ground, and divide the result by 50. The figure obtained is the

volume of the body of the stack in cubic feet.

For the top conical portion of the stack, square the circumference in feet at the eaves and multiply this figure by the height in feet of the top or peak above the eaves. Divide by 38 and the result obtained is the volume in cubic feet of the top portion. By adding the volume of the base and top together, the total content of the stack is obtained with an accuracy of two or three per cent.

CUBIC CONTENT OF A RECTANGULAR STACK.

To determine the volume of a rectangular stack—

(1) Multiply length in feet by breadth in feet at base.

(2) Multiply together length and breadth in feet at eaves.

(3) Add length at base and length at eaves in feet, together and multiply this figure by the sum of the breadth at the base and the breadth at the eaves in feet.

Add (1), (2) and (3) together, and multiply by the height in feet of the eaves above the ground level.

Divide this product by 6, and the result is the volume of the body of the stack in cubic feet.

For the top portion—

(4) Multiply together the length and breadth in feet at the eaves.

(5) Multiply the breadth in feet at eaves by the sum of the length at the eaves and the length along the ridge in feet.

Add (4) and (5) together, multiply by the height of the ridge above the eaves in feet and divide by 6.

This gives the volume of the portion above the level of the eaves, which when added to the volume of the body gives the volume of the whole stack.

EXAMPLES.

Consider a circular stack the measurements of which are 60 feet around the ground level and 70 feet around the eaves; 9 feet high at the eaves and 8 feet in height to the top from the eaves. Applying the formula for circular stack, we find—

Cubic content of body =

$$\frac{(60 + 70)(60 + 70) \times 9}{50}$$

$$= \frac{16900 \times 9}{50}$$

= 3,042 cubic feet.

Volume of conical top =

$$\frac{70 \times 70 \times 8}{38}$$

$$= \frac{4900 \times 8}{38}$$

= 1,031 cubic feet.

Total volume of hay stack =

3042 + 1031

= 4,073 cubic feet.

RECTANGULAR STACK

Consider a rectangular stack, the dimensions of which are:—40 feet by 20 feet at base; 45 feet by 23 feet at eaves; 30 feet long at the ridge; eaves 10 feet above the ground; ridge 10 feet vertically above the eaves.

Applying the formula—

Volume of base or body =

(1) $40 \times 20 = 800$

(2) $45 \times 23 = 1{,}035$

(3) $(40 + 45)(20 + 23) = 85 \times 43 = 3655$

(1) + (2) + (3) = 5490

$$\frac{5490 \times 10}{6}$$

= 9,150 cubic feet.

Volume of portion above eaves =

(4) $45 \times 23 = 1{,}035$

(5) $23 \times (45 + 30) = 23 \times 75 = 1725$

(4) + (5) = 2,760

$$\frac{2670 \times 10}{6}$$

= 4,600 cubic feet.

Total volume of stack = 13,750 cubic feet.

Approximate Number of Cubic Feet per Ton of Hay.

The following table shows the approximate number of cubic feet per ton of hay:—

Period.	Oats.		Wheat.		Lucerne.
	Sheaf.	Loose.	Sheaf.	Loose.	
	c. ft.	c. ft.	c. ft.	c. ft.	c. ft.
Freshly stacked ...	350	400	400	500	400–450
One month after stacking	300	350	350	400	350–400
One year after stacking	300	325	325	350	300–350

These figures are subject to considerable variation, and frequently fresh cereal hay is lighter than the figures given above.

(Continued on page 534.)

The Way to—

BETTER PASTURES IN THE CENTRAL WEST.

(*Continued from page* 408.)

B. D. AMENT, H.D.A., Agrostologist.

PASTURE improvement is now much more generally practised in this area of the State than in the past, and it is important that farmers and graziers be informed of the most modern methods of handling this most important of all our crops.

In July and August issues the author discussed the treatment of natural pastures and the establishment of permanent sown pastures. This instalment is devoted to temporary pastures in rotation with crops, and to the use of suitable strains and seed.

Types of Improvement—continued.

Temporary Pastures—for Use in Rotation with Crops.

It is becoming increasingly apparent in all areas where cropping is carried on, that greater attention must be given to improving soil fertility if these operations are to be successfully and economically continued. Some of the minerals and organic matter removed in crops are replaced by fertilisers, stubble and animal droppings, but not sufficiently to prevent continuous loss of fertility, unless suitable rotations and adequate applications of fertilizers are adopted.

On some small areas under intense cultivation, organic matter in the form of farmyard manure can be used, but this method is not practicable over large areas and crop rotations must be adopted. Leguminous plants are capable of adding to fertility and the droppings of animals grazing on temporary pastures assist. A suitable pasture, with one or more legumes as the main constituent, grazed by stock, will provide excellent returns from the land while it is not under crop.

It is very desirable that the pasture be sown successfully with the last crop, in the case of cereals. This is possible with the available legumes and thus the only cost of establishing the temporary pasture is the price of the seed, whereas twelve months are gained, which is important in rotations, particularly where cultivation areas are limited.

On the Central Tableland and higher rainfall sections of the Central-Western Slope, Subterranean clover is the ideal plant for use in rotations, and a grass such as Wimmera Rye should be added to balance the pasture and increase its carrying capacity.

A suitable mixture for sowing with the last cereal crop is:—

Subterranean clover (midseason), 4 lb. per acre.

Wimmera Rye grass, 1 lb. per acre.

For the higher-rainfall, mixed-farming areas of the tablelands, such as Millthorpe, where cultivation areas may be limited or it is desirable that a shorter term under pasture be included in the rotation, the following mixture can be used to advantage:—

Subterranean clover (midseason), 3 lb. per acre.

Red clover, 4 lb. per acre.

Italian Rye grass, 8 lb. per acre.

This mixture may be sown with or without a cover crop. When sown without a cover crop, or where it is intended that the land shall remain under pasture for no longer than two years, the Subterranean clover may be deleted. This mixture has proved successful in rotation with such crops as potatoes, though results have not been satisfactory in drier years.

For the remainder of the Slopes, lucerne and Earlistrain Subterranean clover should be combined and a suitable mixture would be:—

Lucerne, 2 lb. per acre.

Subterranean clover (earlistrain), 3 lb. per acre.

Wimmera Rye grass, 1 lb. per acre.

For wheat areas on the Plains, where it is drier, delete the Subterranean clover.

The land should remain under pasture for at least three clear years before it is returned to cropping. The ideal rotation then is two or three years under crop and three to four years under pasture. Where arable areas are limited, this rotation may have to be modified by cropping the land for longer periods.

Where Midseason Subterranean clover is used, it may not be necessary to resow it once it is well established.

These rotations can be used in conjunction with crops other than cereals. It is usually necessary, however, to sow the pasture separately following cropping.

Results with crops grown after the land has been under a suitable pasture for a number of years, have shown that excellent results can usually be expected. In a normal season, however, the first cereal crop grows so strongly that lodging often occurs unless the crop is grazed heavily to control its growth. Exceptionally good crops have been grown on land previously considered too poor for economical cropping. One Central Tablelands farmer cut 5 tons of oaten hay per acre on land considered too poor for cropping before being put down to Subterranean clover.

Strains.

Equally as important as selecting the most suitable species of a crop—in some cases perhaps more important—is the use of the most suitable strain of each pasture species, since the results extend over longer periods.

Sow Only Good Seed.

It pays to sow only good seed, and, wherever obtainable, government certified seed. In New South Wales, the Department of Agriculture's Pasture Seed Certification Scheme includes *Phalaris tuberosa* and Subterranean clover. Since 1939, New South Wales Government Certified Midseason Subterranean clover seed has been produced on the Central Tablelands (in the Blayney district) and a high standard of purity and germination has been maintained.

While most of the *Phalaris tuberosa* seed has, in the past, come from the New England district, good quality seed has been produced on the Central Tableland, and it is expected that locally produced certified seed will be available in future.

When it is not possible to purchase government certified seed, purchases may be made from reputable seed merchants who sell good quality seed which conforms to the standards of purity and germination required by the New South Wales Agricultural Seeds Act.

When purchasing direct from a grower, when the seed is not certified, as in the case of lucerne, the purchase should, if possible, be made on sample. A simple germination test can be made by placing 100 seeds between sheets of blotting paper, which should be kept moist and in a warm place, and then counting the seeds which germinate.

Inoculation of Legume Seed.

Most farmers and graziers are aware that leguminous plants — such as lucerne, clovers, trefoils, peas, beans, etc.—produce wart-like nodules on their roots, formed by bacteria which are usually present in the soil. It is not generally realised, however, that unless the appropriate bacteria are present in the soil to form these root nodules, the plants will not grow normally and often die before reaching maturity.

The strain or species of bacteria which produces nodules on the roots of one genus or group of legumes, will not do so on another group. On the other hand, the species of bacteria appropriate for one species of legume is also appropriate for all other species in the same genus. The organism which is parasitic on White clover is also suitable for Subterranean clover, but not suitable for lucerne.

When it is known or suspected that the appropriate species of bacteria is not present in the soil, it is very easily introduced by inoculating the seed of the legume at sowing time with a culture obtainable from the Biologist, Department of Agriculture, Sydney. A charge of 2s. 6d. per culture, sufficient to treat 30 lb. of small seed, such as lucerne, is made, and full instructions for seed treatment are supplied.

It is not always necessary to inoculate pasture legume seeds. On certain of the poorer soils of the tablelands, such as in the Portland district, however, it is necessary to inoculate lucerne seed to prevent complete failure. Generally speaking, on soils where trefoils thrive, lucerne does not require inoculation, and where clovers, such as Ball clover, grow well, the seed of such clovers

as Subterranean, White or Red, do not generally require inoculation.

Preparation of Seed Bed.

As practically all of the pasture seeds are small, best results are obtained when the seed-bed is fine, firm and moist. The ideal to aim at is to have the seed-bed free of weeds, consolidated to within an inch of the surface and covered by a loose soil mulch. This enables the seed to be sown ½ to 1 inch deep on to the firm moist soil, ensuring maximum germination and early growth. Many failures and disappointments have been due to insufficient attention being given to seed-bed preparation, resulting in a deep, loose bed.

Initial ploughing need not be deep—3 to 4 inches is usually sufficient—and should be carried out in time to allow for subsequent workings and rainfall to eliminate weeds, conserve moisture and consolidate the seed-bed. Excessive working of the soil should be avoided to prevent too fine a condition which tends to make it set hard on the surface after rain and may prevent some of the seedlings coming through.

Sowing.

Pasture seeds may be sown through a seed-box attachment on drill or combine, or by mixing the seed with the fertiliser and sowing through the manure box of the drill, combine or manure spreader or through a fertilizer broadcaster. The use of the last-named implement for this purpose is not desirable as it is difficult to obtain an even distribution of the seed over the land.

When seed is mixed with the fertiliser and sown through drill or combine, the tubes should be removed from the hoes or tynes and the seed allowed to drop on the surface to be covered by light following harrows. Occasional stirring in the manure box to keep seed and fertiliser thoroughly mixed is essential, otherwise light seeds, such as Rye grass, tend to work to the top. In all cases, two sowings each with half the seed, the second at right angles to the first, will give a more even distribution.

Time of Sowing.

The best sowing time for most pasture species is the autumn. On the tablelands the best month is usually March, but sowings may be made as early as February and as late as May. With a March sowing, some growth is usually made before the winter becomes severe, and it is usually late enough to avoid loss of seedlings through burning off. On the Slopes, late March and April are the best months.

It is inadvisable to allow seed and superphosphate to remain mixed for more than 24 hours before sowing, as the fertiliser may seriously affect the viability of the seed.

Successful spring sowings of the perennials—lucerne, *Phalaris tuberosa*, Perennial Rye and Red clover—have been known to be successful. However, there is a definite risk of hot dry conditions in spring and summer burning off the young seedlings before they become well established.

(To be concluded.)

Docket System to be Introduced.

At Sydney Municipal Markets.

INTRODUCTION of the docket system at the Sydney Municipal Markets in respect of sales of fruit and tomatoes will mean a great deal to primary producers, stated the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) commenting on the approval of this plan by the State Cabinet.

Mr. Graham stated that the Farm Produce Agents Act will provide for the duplicate dockets issued by agents at the time of sale to indicate details of the sale, the name of the agent and the name or other identifying marks or registration numbers of both grower and purchaser. A badge will be issued to each retailer, on which will be shown the registration number of his retail shop, and this number could be used by agents on their dockets to identify the buyer, thus saving a considerable amount of time in writing out the dockets.

"For the past forty years," said Mr. Graham, "growers have been endeavouring to have this docket system introduced at the City Markets, and many expressions of appreciation have been received, following announcement of the decision."

Seed Treatment for Maize.

MAIZE grain is frequently contaminated with fungi that are capable of causing defective germination and seedling blight diseases. These fungi occur both in and on grain. Proper methods of seed selection enable the grower to discard all ears which show obvious signs of mould growth or other abnormalities likely to be associated with fungous infection, but they do not ensure the exclusion of grain that is infected internally, as this type of infection does not produce any symptoms by which it can be recognised in the grain. The sowing of seed that is infected internally is one of the commonest causes of faulty germination and patchy, uneven growth in maize. This is particularly the case in early-sown crops, cool weather often being experienced during the period of germination and early seedling growth.

It has been found that seed treatment with an organic mercury dust such as agrosan or ceresan greatly reduces the losses arising from defective germination and seedling blight diseases. All growers of early-sown maize in coastal districts and all maize growers in tableland areas are strongly advised to dust maize seed with one of the dusts mentioned at the rate of 2 oz. per bushel. Provided the grain is dry and well-matured, dusting can be done at any time after threshing, but in most cases it is recommended that treatment should be left until a few days prior to sowing.—BIOLOGICAL BRANCH.

Control of Onion Thrips.

Efficacy of D.D.T. Spray.

THE results of spraying experiments carried out at Somersby during 1946-47 for the control of thrips on onions showed that satisfactory control was obtained with both D.D.T. and B.H.C. (benzene hexachloride) treatments, but that D.D.T. was the superior treatment. Treatment with D.D.T. sprays gave an increase in yield over the untreated plots of from 1.9 to 2.3 tons per acre in one experiment, and of 1.75 to 1.85 tons in a second experiment.

The gross cash value of these increased yields, based on the market price of £23 per ton, ranged from £43 14s. per acre to £52 18s. per acre in one experiment and from £40 5s. per acre to £42 10s. per acre in the other experiment.

The calculated cost of obtaining these increased returns by controlling the thrips was from £2 3s. 9d. to £4 7s. 6d. per acre for materials.—P. C. HELY, Entomologist.

Common Trouble with Young Seedlings.

Control of "Damping-off."

"DAMPING-OFF" is a trouble which is likely to attack many varieties of young seedlings. The onset of the disease is usually rather sudden. Seedlings which appear flourishing may be found next day to have toppled over, and an examination reveals that the stems at ground level are in a soft, withered condition. Once it appears, the disease will spread very rapidly and severe losses are likely.

The cause of "damping-off" is sometimes thought to be excess moisture, hence the name, but though wet conditions favour its development they are not the actual cause. "Damping-off" results from the attack by soil-inhabiting fungi on seedling tissue at or about ground level. Fungi most commonly associated with "damping-off" are species of *Pythium* and *Rhizoctonia*. Only young tender seedlings are susceptible.

The most satisfactory method of preventing "damping-off" is to use sterilised soil. Complete sterilisation is necessary, and care must be taken to prevent re-contamination, as the disease is very much more severe in contaminated sterilised soils than in unsterilised soil.

As a precautionary measure, if unsterilised soil is used, the seed may be treated with a fungicidal dust which will give some degree of protection against soil-inhabiting fungi, or, alternatively, the seedlings may be sprayed at weekly intervals from the time of emergence until they are ready for transplanting. If no protective measures are taken and the disease appears the seedlings should be sprayed at once. Three applications at intervals of four to five days should check the spread of the disease.

The spray should thoroughly drench the seedlings and run down the stem to the soil. The sprays suggested are: (1) Bordeaux mixture (3 oz. bluestone, 1½ oz. quicklime, 5 gallons water); or (2) Copper oxychloride at the rate of 1 oz. to 2 gallons of water.

Several proprietary brands of seed-dusting fungicides are available.

A leaflet on the sterilisation of seed-bed soil (Plant Disease Leaflet No. 103) is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.—BIOLOGICAL BRANCH.

THE BLACK PEACH APHID

(Anuraphis persicæ-niger)

In the Murrumbidgee Irrigation Area.

E. J. WASON, B.Sc.Agr., H.D.A., Entomologist.

THE Black Peach Aphid, which is to be found in most of the peach-growing districts of New South Wales, is a pest of economic importance of canning peaches in the Murrumbidgee Irrigation Area.

Due to the subterranean habits of this aphid, eradication is more or less impossible. However, since the advent of D.D.T., the more effective control now possible has assisted in reducing the damage and spread of this pest to a minimum.

Life History.

The Black Peach Aphid, which is said to be a native of North America, attacks both the roots and the above-ground portions of the trees.

Wingless forms, in all stages of development, are to be found on the subterranean portions of the trees. Colonies have been observed just below ground level at the junction of the trunk and main roots. Small colonies have also been recorded on the feeder roots at a depth of at least 12 inches, some 12 to 18 inches from the butt. In Illinois, U.S.A., aphids have been found as far as 2 feet away from the trunk.[1] Winged forms have never been observed on the roots.

Fig. 1.—Untreated Peach Tree, Heavily Infested with Black Peach Aphids.

[Photo. A. E. Vincent.

Fig. 2.—Peach Tree that has been Sprayed with D.D.T., and is Uninfested with Aphids.

[Photo. A. E. Vincent.

While aphids are to be found on the roots throughout the year, the above-ground portions of infested trees are free from aphids for a period during the summer, as with the arrival of hot conditions the aphids move back to the roots. This migration has been observed as early as November in some seasons. From late December to early March, this aphid is rarely found on the above-ground portions of trees known to be infested.

Infestation of low-borne lateral growth has been observed to commence from late March to early April, depending upon the weather conditions. This aphid appears to

flourish under mild, moist conditions, and has been recorded grossly infesting trees as early as May or June, although this is unusual. It is during the spring months that this aphid is most active, and it is then that the main damage to the tops of the trees occurs.

Wingless forms predominate at all times, but during September and October it is usual for winged forms to appear amongst the aphid colonies. These winged forms appear to be the main means of distribution of this aphid throughout individual blocks. This migration is especially noticeable in blocks of young trees.

Fig. 3.—Lateral Twigs of Peach showing Die-back due to Black Peach Aphid Attack.

[Photo. A. E. Vincent.

The mature aphids, both wingless and winged forms, measure slightly over 1/16th inch in length, and are glossy-black. The bodies of the mature wingless forms have a bloated appearance. The immature forms, which are amber-brown, take from ten to twelve days to reach maturity in the spring and up to thirty days during the winter months. The severe winter conditions, which are usual in this area, have no effect other than to prolong the period required for their development.

This species is not known to lay eggs, reproduction taking place by the birth of living young. They are gregarious to the extent that a single lateral or limb may be covered by masses of aphids while the other limbs of the tree are free of infestation.

A small ant (*Iridomyrmex rufoniger*) is usually to be found associated with this aphid. Paillot[2] who made observations at Saint-Genis-Laval, states that ants transfer a closely allied species of aphid from the roots to the branches, but this transference has not been observed here. The mature wingless forms have, however, been observed migrating from the roots up the main trunk, where they settle down more or less immediately on the lateral growth and commence to reproduce.

The above-mentioned species of ant has been observed stroking aphids, and appears to feed extensively upon the excreta or honey-dew.

Hosts.

While canning peaches are the main host, apricots growing on peach stock have been infested over a period of several years. In the Young district, where this pest is also of economic importance, plums, nectarines and peaches, both freestones and clingstones, are infested. It is also reported to attack almonds, but this has not been observed in the Irrigation Area.

Damage.

It is the tops of the trees which suffer the most damage. Lateral growth, which will carry next season's crop, is the first part to become infested. The aphids first confine themselves to the undersurface of this lateral growth, and if not checked will cause a shrivelling and curling, followed by a gradual dieback from the tip.

During the spring the aphids, if plentiful, migrate to the blossoms and feed by sucking the sap from the flower parts or from the young fruit which has just set. Shrivelling and shedding of young fruits then causes a poor setting. After the leaf buds burst, the colonies on heavily-infested trees swarm on to the leaves causing them to shrivel, curl, wilt and finally drop. The Green Peach Aphid (*Myzus persicae*) causes a typical curling of the leaves, but this type of injury is not so noticeable with Black Peach Aphid infestations.

Where control measures are not adopted, heavily-infested trees will succumb to the ravages of this insect, and especially so where young trees are infested. Trees are most susceptible to injury during the first and second year after planting.

The excretion of honey-dew by this aphid is primarily responsible for the development of the sooty mould fungus (fumagine) which covers the limbs and lateral growth, thus giving the trees a dark appearance.

Blossoming is advanced approximately seven to ten days on heavily-infested trees when compared with uninfested trees.

List and Newton[3] of Colorado state that the greater part of the injury to the trees is caused by the root-feeding colonies which in heavily-infested trees may cause stunting of the trees and a yellowing of the foliage. Local observations do not confirm this statement. If the above-ground colonies of aphids are controlled early while the population is low, the trees soon recover, and in a matter of weeks it is almost impossible to differentiate between the previously infested and clean trees. Further, in many instances the biggest trees in a block are the ones infested. Possibly the fact that trees are grown under irrigation may lessen the effect of the root-feeding colonies.

CONTROL.

Natural Enemies.

Two species of ladybirds, *Coccinella transversalis* and *Leis conformis*, in both the larval and adult stages, as well as the larvae of the Syrphid fly (*Xanthogramma grandicorne*) and of a Green Lace-wing (*Chrysopa* sp.) feed on this aphid.

A Branconid wasp parasite (*Aphidius* sp.) which deposits its eggs within the living aphid has also been recorded. In some seasons, close on 100 per cent. parasitisation has been observed on heavily-infested trees late in the spring.

These predators and parasites exercise only partial control, as the tops of the trees are usually heavily infested with aphids before the predators and parasites become at all numerous. In other words, there is a time lag of three to four weeks before the predators and parasites can deal with a very high aphid population.

Treatment of Nursery Stock.

Experience in the Murrumbidgee Irrigation Area indicates that all nursery stock should be treated for the control of this pest before being transplanted. It is the writer's considered opinion that this species of aphid became established in the Murrumbidgee Irrigation Area through infested nursery stock. In one consignment alone, of several thousand trees, the roots of approximately 60 per cent. were found to be heavily infested with wingless aphids in all stages of development.

Fig. 4.—Lateral Twig of Peach, showing heavy Infestation of Black Peach Aphids, and Curling of the Leaves.

[*Photo. A. E. Vincent.*

The soil around the roots should be removed by either soaking in water, or preferably by hosing with a water jet. On drying, the trees should be fumigated with HCN gas, and then pugged in fresh soil to prevent drying out of the roots. Where fumigation chambers are not available, the roots of the trees should be immersed in or sprayed with nicotine sulphate and soft soap solution, taking care thoroughly to drench the roots. Nicotine sulphate is

used at the rate of 1 pint to 75 gallons of water and 3 lb. of soft soap is added to the spray mixture.

Replanting Old Peach Land Known to Have Been Infested.

Where peaches are to be planted in old, previously infested peach land, growers would be well advised to see that all the roots of the old trees are thoroughly removed and that the new trees are not planted in the old holes. The land should be fallowed for a period of at least twelve months or, preferably, two years. Finally a close inspection should be made for the presence of the aphid on the young trees for several seasons. If the aphid does show up on these trees, every effort should be made to try and keep the amount of damage to a minimum so that normal growth will take place.

Soil Fumigants.

Various soil fumigants, including paradichlorobenzene and carbon bisulphide emulsion, have been tested with little or no success.

Sticky Bands.

The use of sticky bands applied to the trunk to prevent migration of mature aphids from the roots to the tops of the trees has also proved ineffective. When the night temperatures are low, the sticky material sets hard, and the aphids are able to walk over the bands with ease, and so gain access to the tops of the trees.

Spraying.

The following sprays have been tested for the control of Black Peach Aphid:—

(1) Dormant and semi-dormant oils, 1 in 25.

(2) Dormant sprays such as DNC wash or tar distillate, 1 in 40.

(3) Aphicidal sprays:—

Nicotine sulphate plus a wetter and spreader such as white oil 1 per cent. in the semi-dormant period or soft soap 1 lb. to 25 gallons in the growing period. Nicotine sulphate may also be combined with Bordeaux mixture or lime-sulphur.

Derris at the rate of 1 lb. to 50 gallons plus 5 lb. of soft soap.

The above sprays have all given good control when properly applied at a high pressure and care taken to see the aphid colonies on the under surfaces of the lateral growths were thoroughly wetted. However, in a matter of seven to ten days, the sprayed trees generally became reinfested by mature wingless forms migrating from the roots.

Use of D.D.T.

During the past three seasons, field trials have demonstrated that sprays of D.D.T. at a concentration of 0.1 per cent. are not only efficient as an aphicide, but also prevent re-infestation for periods varying from eight up to twelve weeks during the spring. A single properly-timed application of D.D.T. is much more effective than three or four sprays of nicotine sulphate. Further, D.D.T. is just as effective during cold weather as it is during warm to hot conditions, whereas nicotine sulphate gives best results when the latter conditions prevail. The use of D.D.T. during the blossoming period is not recommended.

Suggested Spray Programme.

Where peach trees become infested during the autumn, and conditions are ideal for the development of the aphid, growers are recommended to spray infested trees with a D.D.T. spray, at a concentration of 0.1 per cent., preferably after the trees have been pruned.

It is usual at this time of the year to find aphid colonies confined to the undersurfaces of the lower laterals and it is only necessary to spray the lower half of infested trees.

The dormant sprays, such as DNC wash and tar distillate which are applied preferably late in July, for the control of the Green Peach Aphid, will assist greatly in reducing the Black Peach aphid population and keep it low until late August.

The application of a D.D.T. spray at a concentration of 0.1 per cent. at the late bud-swell stage, *i.e.*, late August, is the most important spray for the control of this pest. Such a spray, if thorough coverage is obtained, will keep the trees free from

aphids during the period of greatest aphid activity in September and October when the major portion of the damage usually occurs. Further, this spray will prevent re-infestation at the time when the winged forms are normally produced.

With all the above-mentioned materials, a drenching type of spray, applied at a high pressure, at least 250-300 lb. per square inch is essential in order to obtain thorough coverage.

References.

[1]CHANDLER, S. C.—

1940. Control of Black Peach Aphis. *Journ. Ec. Ent.* 33: (1) 204.

[2]PAILLOT, A.—

1930. Rapports sommaires sur les travaux accomplis dans les laboratoires en 1929. *Ann Epiphyties* 15: (6) 374-403. (Abstract in R.A.E. 1931. 19: 85.)

[3]LIST, G. N. and NEWTON, J. H.—

1936. Insect and Mite Pests of the Peach in Colorado. Colo. Exp. Sta. Bul. No. 427.

Approved Vegetable Seed—October, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.

Kyogle	October 8, 9
Cootamundra (D. Boyd)	October 10, 11
Hay	October 14, 15
Lismore National	October 14, 15, 16
Alstonville	October 22, 23
Holbrook (Thelma Stewart)	October 24, 25
Murwillumbah	October 29, 30
Griffith	October 30, 31
Mullumbimby	November 5, 6
Bangalow	November 12, 13
Nimbin	November 19, 20

1948.

Guyra	February 13, 14
Bundarra	February 14
Inverell	February 20, 21
Bega (Jas. Appleby)	February, 26, 27, 28
Armidale	February 26, 27, 28
Tenterfield	February, 26, 27 28
Walcha	March 2, 3
Glen Innes	March 2, 3, 4
Uralla	March 5, 6
Manilla	March 5, 6
Warialda	March 5, 6
Tamworth	March 9, 10, 11
Bingara	March 10, 11
Quirindi	March 13, 14
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Bellingen (C. P. Franey)	April 12, 13
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Boggabri	April 20, 21
Narrabri	April, 23, 24

INSECT PESTS.

Notes contributed by the Entomological branch.

The Maize and Tomato Moth (*Heliothis armigera*) As a Pest of Linseed.

LINSEED is being grown extensively this year in many parts of the State, but if the crop is to be a success it will be necessary for growers to be alert to the danger of damage by the caterpillars of the maize and tomato moth. The damage is caused by the caterpillars burrowing into buds and immature bolls or capsules and destroying the young seed.

Infestation is expected to be severe in areas where good rains occurred during summer and autumn, and the wisdom of protective treatment of crops will be realised when it is stated that the average loss of yield from caterpillar damage in untreated crops can be expected to be not less than 30 per cent., and in some instances may approximate 70 to 80 per cent.

The world's chief producers of linseed are Russia, India, Argentina, Canada and the United States of America. In normal times Australia imports linseed, chiefly from India and to a less extent from Argentina, to the amount of one to one and a half million bushels annually, valued at about £400,000.

Several attempts have been made to establish linseed culture in Australia, which, in general, have failed because of unsuitable varieties, pests, diseases and the relatively low prices of imported Indian and Argentine linseeds. However, the present world shortage, greatly increased value, the introduction by this Department of disease-resistant varieties and the development of effective means of pest control, all combine to make linseed growing an attractive proposition.

Life History.

The moths are about ¾ inch in length and measure about 1½ inches across their outspread wings. The colour of the moths varies considerably, but generally is buff or reddish-brown with indistinct darker markings on the forewings, and a dark patch on the outer margin of the hindwings. During the day the moths are inactive and are hidden amongst the leaves, but towards late afternoon they may be seen flying from plant to plant to lay their eggs. The female moth lives for about twelve days and may deposit up to 3,000 eggs, the average number per female being about 1,000. The eggs, which are white to yellow, and about the size of a small pin's head, are laid singly, anywhere on the plant, but mainly on the blossoms, young bolls, and tender shoots. The moth attacks a very wide variety of plants and is a serious pest of maize and tomatoes as the popular name indicates.

In warm spring weather the eggs hatch in three to five days.

The fully-fed caterpillars, which measure about 1½ inches in length, vary greatly in

A Horse-drawn Power Duster in Operation.

colour. Some are pale-green to dark-green with various sized black markings; others are pale-yellow with brownish markings, while others again are buff-coloured with broad brown stripes. The caterpillar attains its full size in about fourteen to twenty-one days in warm weather and from three to six weeks under cooler conditions. When fully fed, the caterpillar burrows into the soil to a depth of about 4 inches, and there enters its pupal or chrysalid stage.

Moths may emerge from these pupae as soon as fourteen days later, but under cool or dry conditions emergence may be delayed for several months. When soils are dry the moths will not emerge from the pupae. Thus, during the warmer months, the moths usually appear in crops a few days after a fall of rain which is sufficient to wet the soil down to 4 inches or so, or where ground has been moistened by irrigation.

In warm weather the length of the life-cycle, from egg to adult, may be as short as thirty days, but allowing for the somewhat cooler conditions of the spring, the period of time for development from egg to adult is about forty to forty-five days.

This Year's Infestation.

The moths appeared in linseed in the latter half of September, just after the crops commenced to flower. Egg-laying will be heavy during October and will diminish about the beginning of November. A second period of heavy egg-laying, from another generation of moths, may commence towards the end of November, but this should not be of any consequence so far as linseed is concerned, as by then the large majority of bolls will be approaching maturity and will not be attacked by the caterpillars.

CONTROL.

Dusting with 2 per cent. D.D.T.

For the control of this caterpillar on cotton, in the United States of America, dusting with calcium arsenate 6 to 8 lb. per acre was the standard practice for many years, but D.D.T. is now known to be more effective. In Australia, D.D.T. sprays and dusts have proved very effective against the same caterpillar in tomatoes. Treatment is only necessary if the pest appears, but where it does, control measures must be taken immediately.

On linseed, dusting with D.D.T. undoubtedly will give good control at a cost of from 15s. to £3 per acre for materials, depending upon the rate of applying the dust and the number of times the crop is treated. Rate of application at each dusting would be from 20 lb. to 30 lb. of a 2 per cent. D.D.T. dust per acre. The 2 per cent. dust costs approximately 9d. per lb.

Crops will require from one to four dustings, depending upon the severity of infestation, the growth of the crops during October, and length of period over which heavy flowering occurs. In areas where the weather continues dry throughout the spring and yields are expected to be low, a single dusting at the rate of 20 lb. of 2 per cent. D.D.T. dust is suggested. Where crop prospects are reasonably good and yields of 15 to 20 bushels per acre seem likely, two dustings would be worthwhile. The second dusting should be seven to ten days after the first. A third and even a fourth similarly spaced treatment might be given if infestation continued to be severe through October.

The critical period for most areas is expected to be from late September to about mid-October. Infestation should then be at its peak, while flowering and setting of the young bolls also will be heavy. In the northern half of the State dusting should have commenced about the third week of September, and in the southern half during the last week of September.

Machinery for Dusting.

A suitable machine for dusting is the Y-2 power duster which is capable of dusting a 16-foot wide strip and will cover 4 to 8 acres per hour depending on speed of travel through the crop. It may be fitted behind a tractor, on a motor truck or on a horse-drawn vehicle. Calm conditions are required for dusting, the late afternoon being considered the best period of the day for the work.

Spraying with D.D.T.

For a few growers who possess orchard spray or jetting plants, power spraying may be practicable. D.D.T. sprays should be used at 0.1 per cent. concentration—2 lb. of a dispersible D.D.T. powder, or ½ gallon of a 20 per cent. D.D.T. emulsion should be used to 100 gallons of water. From 100 to 150 gallons of spray mixture would be re-

quired to cover one acre. An orchard power spray could be fitted with spray booms carrying six spray nozzles spaced 18 inches or so apart and capable of spraying a strip 8 feet to 10 feet wide. From six to ten acres per day could be sprayed with a power-driven orchard spray, provided water was readily available. If a water tank is used to carry water to the spray machine, this acreage can be doubled.

Fruit Flies (*Strumeta tryoni*).

ALTHOUGH the infestation of fruit flies in early fruits, last season, was only light, heavy infestations occurred in the late fruits throughout the metropolitan and coastal areas. Inland areas at which infestations occurred included Tumut, Canberra, Orange, Murrumbidgee Irrigation Area and Boggabri. The southern coastal limit appears to be in the neighbourhood of Bateman's Bay.

These comments refer only to the Queensland fruit fly. The Mediterranean fruit fly has not been taken since 1941, although a systematic survey was made last season (1946-47). In 1941 the Mediterranean fly was bred from citrus fruit in the Kenthurst district and was taken in traps at Richmond and St. Ives. A sample of peaches from the metropolitan area was also found to be infested with this species. This continued rarity of the Mediterranean fly is in sharp contrast to conditions prevailing twenty years ago when both species were to be taken in comparatively equal numbers.

In the Sydney area the fruits of the wine palm (*Cocos yatay*) were found to be infested for the first time.

Measures for the control of fruit flies are compulsory under the Plant Diseases Act, even where only a single fruit tree is grown. These compulsory measures include the use of foliage poison baits and the regular destruction of all infested and fallen fruits. Home gardeners and others are reminded that the fruit of all loquats grown in coastal areas of this State must be removed from the trees by 31st October.

New Season Infestation.

Fruit flies pass the winter in the adult stage, but usually, little breeding takes place during that period, although occasionally maggots are to be found in second crop apples and citrus fruits.

Infestation for the new season usually commences in September, and becomes still more evident in October. Loquats are considered to be the main host for this early infestation. A slight infestation of flies in early ripening loquats is of considerable importance, as this small population, arising from over-wintering flies, may serve to build up a severe infestation of the main loquat crop. As citrus fruit may also be infested to a very limited extent, and thus further provide a source of infestation, this fruit should not be overlooked early in the season.

Life History.

Many home growers are under the impression that the flies deposit their eggs in the blossoms, but this is not so. The flies lay their eggs within developing fruits, particularly when these commence to ripen, and ripe fruit is very susceptible to attack.

The Queensland Fruit Fly.

Note the almost clear wings and light markings on the body.

The minute, elongate eggs are deposited to a depth of ⅛ to ¼ inch in the fruit, in punctures or "stings" made by the ovipositor of the female, and are usually placed close together in small batches.

They hatch in two to three days and infestation of the fruit soon becomes noticeable; that is, the decay or "give" in the fruit can readily be detected by hand. The legless larva or maggot, which measures about one-third of an inch in length when fully-fed, is white to creamy-white, and bears at its head end a pair of small, black, hook-like jaws by means of which it burrows through the fruit tissues. The larval period occupies about twenty days. The maggots are able to curve the ends of their bodies together, and then suddenly releasing their hold, spring for a distance of several inches.

When fully-fed the maggot crawls from the fruit, which has usually fallen from the tree at this stage, and makes its way into the ground to a depth of 2 or 3 inches, and there its skin hardens to form a small, elongate-oval puparium, which is light-brown in colour. The adult fly, which develops within this puparium forces its way through one end after about twelve days, and makes its way up through the soil to the surface, where its wings soon expand and harden and it flies off.

The adult, which is a little larger than the common house fly, is rather wasp-like in general appearance and reddish-brown in colour. The thorax or mid-portion of its body is marked by a number of distinct lemon-yellow patches which are very pronounced in life. It has only one pair of wings, which are clear, with the exception of a narrow dark band along their front margins, and a transverse stripe near their base.

The time occupied from egg to adult is above five weeks, but eggs are not laid until about a week after emergence from the puparium. The adults live and lay eggs for lengthy periods, so that four or five, or more, overlapping generations of flies may develop each year.

Control.

The formulae for the foliage poison baits prescribed under the Regulations are:—

(*a*)	Sodium fluosilicate	2 oz.
	White sugar	2½ lb.
	Water	4 gals.
	or	
(*b*)	Tartar emetic ..	2 oz.
	White sugar	2½ lb.
	Water	4 gals.

The sodium fluosilicate should be dissolved in practically the full quantity of water required. A vigorous stirring for about five minutes is necessary as the powder falls to the bottom of the container. Although sodium fluosilicate is more readily soluble in warm water, the quantity of water required is not appreciably less than when cold water is used.

Tartar emetic is readily soluble, and has been proved to be at least twice as effective as sodium fluosilicate in killing the flies. It is less likely to injure the foliage.

To Prepare Small Quantities.—Where only a few trees have to be baited the following procedure will be found useful:—Dissolve 1 oz. of tartar emetic in 1 gallon of water to make a stock poison solution. This solution should be stored in a glass container, corked securely and labelled "Poison." When required for use take:—

1 pint of stock solution; *add*
1 pint of water and
2½ ounces of sugar.

The quart of poison spray thus prepared will be sufficient to treat four to six trees. and the stock solution should suffice for the season's requirements for the average household orchard.

Application of the Poison Bait.

The bait is applied to two or more patches of the foliage, and at the rate of at least 6 fluid ounces to each tree. A pump or syringe may be used, but splashing with a large brush is also effective. Care should be taken, as far as possible, to avoid wetting or splashing the fruit. If rain falls soon after the application of the bait a second treatment should be given.

The treatment must commence at least five weeks before the normal time of the ripening of the particular variety of fruit to be treated, and the spray should be applied at weekly intervals until all fruit of that variety has been harvested or removed.

Although baiting at weekly intervals is prescribed, successful growers usually bait twice a week or more often if rain follows an application. Under home garden conditions, baiting every second day is suggested, as a very high population is usually present due to the neglect of neighbouring trees.

Where the last variety of fruit has been harvested the treatment must be continued for one month after all the fruit has been removed. On citrus trees the spray should be applied during the period of fly activity.

An alternative foliage poison spray* which has given satisfactory results in a number of tests made under home garden conditions is:—

Nicotine sulphate	..	1 fluid oz.
Sugar ..	.. ..	2 lb.
Water ..	.. ..	3 gallons.

This foliage poison spray must be applied every two to three days under conditions of severe infestation. Flies fall to the ground in a matter of minutes after feeding on this material and counts of several hundred flies under one tree have been made during the season. These can recover from nicotine poisoning, but the heat of the ground and the activity of predators apparently offsets this disadvantage.

* P. C. Hely, 1947. Unpublished report.

Destruction of Infested and Fallen Fruit.

All infested fruit, including tomatoes, must be removed from the trees and plants, and all fallen fruit, including tomatoes, must be collected from the ground at intervals not exceeding three days. All such fruit must be destroyed without delay, either by boiling for at least 10 minutes, or by burning or placing in a properly constructed, fly-proof waste-fruit pit.

The daily collection and disposal of infested fruit during periods of severe infestation is undertaken by some growers, and it is a method which cannot be too highly recommended.

Other compulsory measures are set out in the Proclamation.

Zinc Deficiency of Citrus.

ZINC is one of the minor elements which have been found to be necessary in very small quantities for the healthy growth of plants. Citrus, especially, quickly show signs of trouble if sufficient zinc is not available. The symptoms are unmistakeable; the leaves are small and abnormally narrow, and a most conspicuous, whitish-yellow discolouration displaces the normal green of the leaf. At first this shows as a mottle between the main veins, but in advanced stages the whole leaf is discoloured. Seriously affected trees show considerable dieback associated with the little-leaf and mottling, and much reduction in cropping.

Zinc deficiency is prevalent in most citrus-growing areas in the western part of New South Wales, especially on the lighter types of soils. Zinc is best applied in the early spring as a spray of the following composition:—Zinc sulphate 10 lb., hydrated lime 5 lb., water 100 gallons. Improvement in tree health following spraying will be apparent with the next flush of growth.

Soil applications of zinc sulphate cannot be recommended.—BIOLOGICAL BRANCH.

Haymaking—*continued from page 520.*

Approximate Content of Haystacks.

After a paddock has been cut, the farmer will usually know either from experience, or from rough guides such as the amount of twine used, about how much hay is to be stacked.

The size of haystack built should be in accordance with the expected yield. Stacks are usually about as high above the eaves as below when built in correct proportions, and the following table gives an idea of the content of various sized stacks.

WEIGHT OF HAY IN STACKS.

Average Width.	Average Length.	Height to Eaves.	Height of Ridge.	Weight of Hay.
Feet.	Feet.	Feet.	Feet.	Tons.
10	20	8	4	5
10	20	10	5	7
13	28	10	10	14
16	30	12	10	20
20	50	14	10	50

Where a large amount of hay is to be stacked, it is better to build separate stacks suitably spaced to spread the risk of fire.

(*To be continued.*)

PLANT DISEASES

DISEASES OF CHRYSANTHEMUMS.

LIKE other perennial plants, the chrysanthemum is affected with a number of diseases which are passed on from the old plant to the cutting or offset. These include leaf spot and rust, which are fungal diseases, the leaf nematode disease, virus disease and Verticillium wilt.

Leaf Spot and Rust.

Leaf Spot (*Septoria chrysanthemella*).—The symptoms (*see* Fig. 1) are dark-brown spots which develop on the leaves. They are usually circular to begin with, but may extend to involve all or a large part of the leaf. On these dead areas very small black spots can be seen. These are the fructifications of the parasite, and in them are produced large numbers of spores which infect the younger leaves as they are formed. This disease is almost always present, and in wet seasons causes considerable leaf loss and so reduces vigour, or reduces market value by spoiling the foliage.

Rust (*Puccinia chrysanthemi*).—Leaf spot is often mistakenly referred to as rust, but the two diseases are easily distinguished. Rust spots (Fig. 2) are smaller than leaf spot lesions, and are at first blister-like swellings which break open to expose dark-brown dusty masses of spores. Like leaf spot, rust is favoured by moist weather, and if early autumn is showery considerable loss of leaves and reduction of vigour can occur.

Control.

Some varieties of chrysanthemum are very susceptible to the attack of leaf spot and rust, and are more or less affected even in dry seasons. There are many varieties, however, which are resistant to attack, and if suitable resistant types can be selected by the grower no control measures may be necessary. However, it may happen that because of particularly desirable characters of earliness or flower colour, it is desired to grow a susceptible variety, and in this case spraying must be resorted to.

The following programme is suggested:

At the end of the season, cut off and burn the flower stalks. When taking cuttings, remove all but the youngest leaves and dip the cuttings for 5 to 10 minutes in Bordeaux mixture 1-1-20 (see Spray Leaflet No. 1, available from the Department). For this the cuttings may be tied in small bundles (not tightly enough to prevent the dip penetrating through), or they can be tied loosely in a hessian bag and the whole immersed in the dip and moved about to facilitate penetration.

After the cuttings have commenced to grow, spray thoroughly with Bordeaux Mixture 1-1-30. If spring and summer weather is dry, spraying may be necessary only once every 4 to 6 weeks, but if the weather is showery and growth is luxuriant, fortnightly spraying will be necessary.

In most seasons regular fortnightly spraying will be required from late summer until 4 to 6 weeks before flowering.

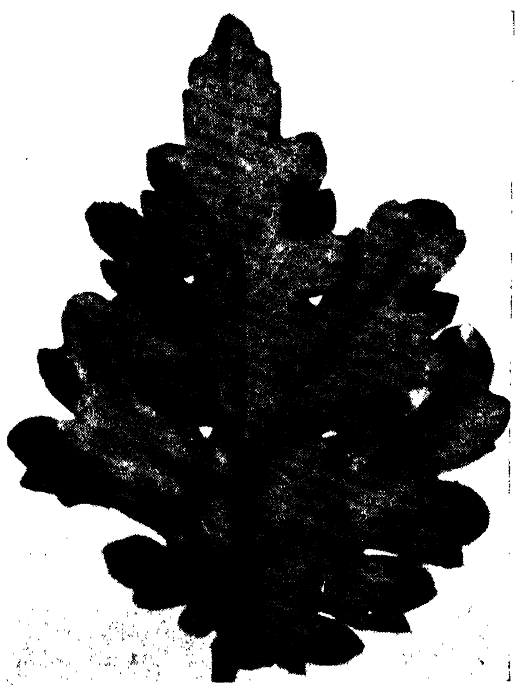


Fig. 1.—Leaf Spot of Chrysanthemum.
Rounded, dark-brown spots develop on the maturing leaves. They often start at the leaf margin.

Bordeaux sprays may then be discontinued, otherwise the spray deposit on the foliage will be undesirably heavy.

If aphids are present, nicotine sulphate should be added to the Bordeaux mixture at the rate of 1 fluid ounce to 4 gallons of spray.

When spraying, the most important point is to get a good coverage of all leaf and stem surfaces. A fine jet and good pressure are desirable.

Home-made Bordeaux mixture is the most effective fungicide, but if a ready prepared spray is required, copper oxychloride (Cuprox, Oxycop or Soltosan) can be used.

Fig. 2.—Leaf Spot and Rust.
This illustration shows the large, rounded, dead areas produced by the leaf spot fungus and the small dark spots caused by rust.

Excessive applications of fertilizer rich in nitrogen, should not be used, as they encourage lush vegetative growth which is difficult to spray effectively.

Leaf Nematode (*Aphelenchoides ritzema-bosi*).

This can be the most destructive of the diseases attacking chrysanthemums in New South Wales, but because it requires a fairly long period of showery or humid weather before flowering to cause maximum damage, it is not evident every year. In some seasons, following late summer rains and wet conditions throughout autumn, the disease is particularly severe and flower crops may be ruined.

The parasite is a minute, worm-like organism called an eelworm or nematode. It feeds and multiplies within the leaf tissues. Infection progresses by worms moving up the stem on the outside, to the leaf above, or being splashed by rain to adjacent plants. New offsets become infected at an early stage. Eggs can remain in the soil for varying periods depending on temperature and moisture.

In its early or mild stages, the symptoms of this disease (Figs. 3 and 4) are almost indistinguishable from those of leaf spot without the aid of a lens or microscope. There is a tendency for the spots caused by the leaf nematode to be triangular, bordered by main veins on two sides, but this is not consistent.

Both leaf spot and nematode spot can occur on the same leaf. In a severe attack, the lower leaves are entirely blackened and hang withered against the stem. The disease progresses upwards and all leaves may be involved, and also the flower, which is browned and decayed, often at one side.

Control of Leaf Nematode.

After the flowers are picked, cut away and burn all old stems and leaves. If only a few plants are involved, the warm water treatment should be given. Lift the crowns and hose free of soil. Immerse in warm water (110 deg. Fahr.) for 20 minutes. Remove and plunge into cold water for 5 minutes, and plant in moist clean soil. The temperature must be maintained by the addition of more hot water, or by a low flame, and the water should be stirred to keep the temperature even. An accurate thermometer is necessary since a lower temperature will not kill the parasite, and a higher temperature may kill the plants.

Alternatively, rooted cuttings can be taken and tied in bundles and treated for 15 minutes. This is not recommended for the less vigorous varieties.

The treatment delays shooting for about a fortnight.

If a drum or copper is used, fairly large numbers of plants can be treated in this way.

As with rust and leaf spot, considerable variation in susceptibility occurs, some varieties being extremely susceptible, others relatively resistant.

Powdery Mildew (*Erysiphe cichoracearum*).

This occasionally shows up towards the end of the season, but is more likely to worry the home gardener than the commercial grower. It occurs particularly on plants in rather shaded positions, being indicated by the development of powdery white spots on the leaf surfaces.

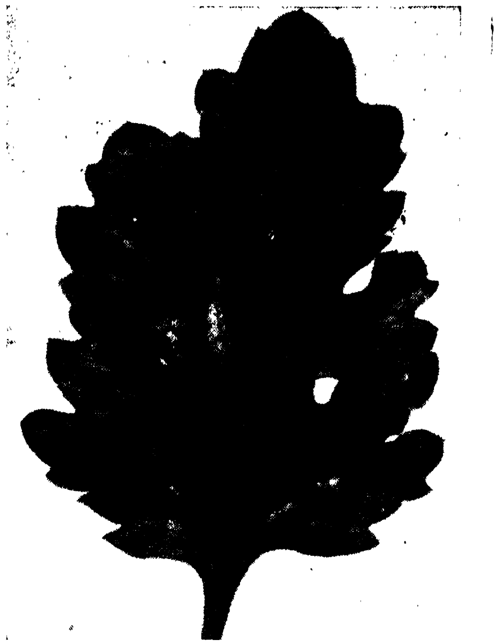


Fig. 3.—Leaf Eelworm.
Large, angular dead areas caused by leaf eelworm infection. Some yellowing of adjacent tissue is often seen.

If special control measures are required, dusting with a fine grade of dusting sulphur at 10-14 day intervals is recommended.

Verticillium Disease.

This is a "wilt" disease and is caused by a parasitic soil-inhabiting fungus *Verticillium dahliae,* which invades the plant by way of the roots and enters and clogs up the woody water-conducting elements of the stem. Affected plants are stunted and hard, and the lower leaves have a pinkish or purplish cast, gradually wither and hang limply against the stem. The younger leaves are usually yellower than normal.

If the stem about ground level is scraped, it will be seen that the wood is stained slightly brown. This is characteristic of Verticillium disease. An infected plant may die out in a season, or linger for a year or so. Cuttings from offsets will always be infected.

Infected plants should be removed and burnt. The infested soil can be sterilized by watering in formalin (1 in 50) 1 gallon per square foot, and covering the area with bags for a few days.

Fig. 4.—Leaf Eelworm.
A chrysanthemum plant badly affected with leaf eelworm, showing withered, hanging leaves.

If it is necessary to save a variety, cuttings should be taken when the shoots are 12 to 18 inches high, only the tips being used. This is necessary to avoid the parasite which extends up the stem to within a short distance of the apex. A proportion of such cuttings will still be infected and must be discarded.

Spotted Wilt (Virus).

This common virus, which causes the well-known disease of tomatoes and other vegetables and flowers, will sometimes attack chrysanthemums. Symptoms are rings or concentric rings of brown on the leaves, and occasionally flowers are distorted or of poor quality. Affected plants should be removed and burned.

Plant Growth Regulators.

PUBLIC interest is aroused from time to time by statements in the press regarding plant hormones or plant growth regulators. Some of the effects produced by these substances on plant growth and development are of economic importance, but unfortunately some exaggerated claims have also been made.

What are Hormones and How Do They Act?

A plant grows by the division of cells at specialized points and by the growth—elongation, expansion and maturation—of these cells. The way in which the development takes place is regulated, at least in part, by chemical substances produced by the plant itself in minute amounts. These are plant hormones. The discovery and isolation in pure form of some of these naturally-produced hormones was quickly followed by the discovery that a number of synthetic chemicals could have a similar effect. A very great deal of research has been done in recent years on the types of reaction of plant tissues to a wide range of organic chemicals used at different concentrations.

Plant regulators might be defined as chemicals, which, when applied in very small amounts to living plant tissues, exercise a stimulating, inhibiting or directive effect on their subsequent development. They act by stimulating cell division in special sites, or expansion in cells which have reached maturity and ceased to grow, or by accelerating or inhibiting these processes in still growing tissues.

Economic Uses of Plant Growth Regulators.

The economic uses to which plant growth regulators have been put can be grouped into the following main classes:—

(1) Root-inducing substances.
(2) Fruit-drop preventives.
(3) Fruit-set inducing substances.
(4) Weed killers.
(5) Substances for delaying the "shooting" of potato tubers.

In addition, certain types have been advocated as stimulating dusts for seeds, others for causing delay in leafing of deciduous trees, for crop thinning, use in transplanting, etc., but further investigation is desirable before these can be accepted as being of general value.

Root-Inducing Substances.

The earliest commercial application of plant hormones was to promote rooting of cuttings. The compound is applied usually as a solution, the cut end of the cutting being soaked for varying periods, commonly 12 to 24 hours, in a solution of strength 10 p.p.m. to 200 p.p.m. or more. The strength and best time of treatment vary with the plant to be treated. A quick dip of a few seconds in a more concentrated solution is also effective for some types. Alternatively, the hormone can be applied as a dust (talc or some other inert material being the diluent), or in a lanoline paste. The chemicals which have been found most useful for root promotion are indole acetic acid, naphthalene acetic acid, indole butyric acid and derivatives of these. A number of commercial preparations are on the Australian market.

The effect of the treatment is to stimulate the formation of roots in the cutting by causing localised cell divisions of a particular type. The most satisfactory stimulant varies from species to species. Some types cannot be stimulated by any known treatment, and other easily-rooting types are not substantially benefited. Hormone treatment does not mean that any of the care ordinarily required for the striking of

cuttings can be neglected. It simply causes earlier or more satisfactory rooting in certain species.

Hormone preparations are on the market also for application to growing plants for the stimulation of root growth. Some species undoubtedly are benefited, but for most growing plants no extra stimulant of this type is required.

Fruit-drop Preventives.

In some varieties of fruit, a proportion of the crop may be shed before it reaches full picking maturity. It is shed because a special layer of corky cells, called an abscission layer, forms across the fruit stalk, cutting off the fruit from the sap supply of the tree. Spraying with growth regulators before the drop is expected prevents the formation of this layer and the fruit remains on the tree. Alpha naphthalene acetic acid at a strength of about 5 p.p.m. has been found to be of value for apples and pears. Recent work in the United States of America indicates that 2, 4-dichlorophenoxy acetic acid may be of use in extremely low dilutions (8 p.p.m.) as a preventive of fruit drop in citrus. It is also said to be effective for Winesap apples, but not for other varieties. A leaflet on spraying for fruit drop control is available from the Department.

Fruit-set Inducing Substances.

Certain plant hormones applied to flowers can induce fruit set and subsequent fruit growth in the absence of effective pollination. This use has been exploited especially for tomatoes in the United States of America and England, where fruit set of certain varieties is very often poor in cold, dull or rainy weather when the days are short. Failure to set is not usually a problem in this State, and the usefulness of the treatment will probably be limited to glasshouse culture. Certain varieties of tomatoes of the cluster type which are not normally grown in glasshouses because of the poor fruit set obtained, may now find a place.

The chemical most effective for this treatment is beta naphthoxy acetic acid. Strawberries and cane fruits are also said in overseas work, to be favourably affected, and recent American reports indicate that bean pod set can be stimulated by application of growth regulators of which alpha naphthalene acetic acid, 2, 4-D, parachlorophenoxy acetic acid and alpha orthochlorophenoxypropionic acid appear to be the most satisfactory.

Weed Killers.

In hormone weed killers the active ingredient is used at a higher concentration than for other purposes. The best known in New South Wales are sodium 2-methyl, 4-chlorophenoxy acetate (Methoxone) and 2, 4-D (sodium salt of 2, 4 dichlorophenoxy acetic acid). They act by stimulating cell elongation and the response shown by the plant is twisting and curling of stem and leaves, splitting of stem and roots and finally death. Their particular value is that they are in some degree selective, grasses and cereals being much less affected than most broad-leaved plants. All weeds, however, are not killed.

Substances for Delaying "Shooting" of Potato Tubers.

The fumes of the methyl ester of alpha naphthalene acetic acid has been successfully used for delaying the development of shoots on stored potato tubers. Commercially this is important in the buying programme of manufacturers of potato chips and may also prove beneficial in prolonging the storage life of table potatoes.

Other Uses.

Seed dusts containing hormone preparations have been experimented with, but the results have been inconsistent and the practice cannot be recommended.

Hormone preparations should not be used for bulbs and corms, as rot-causing organisms are stimulated by them.

The use of hormone treatment for extending dormancy and for blossom thinning is still in the experimental stage.

SEVERAL reports are to hand from farmers in the Murrumbidgee Irrigation Area that growing crops have been attacked by mice. The stems are gnawed into from 3 to 12 inches from ground level, causing the plants to fall over. Mice are stated to be abundant on the M.I.A., especially in rice stubble.

In view of the potential large crop of wheat this season and the world wheat supply situation, the abundance of mice at the present time is of particular significance, emphasising the necessity for properly stacking and mice-proofing all wheat that may have to be stored in the open this year.—T. MCCARTHY, Chief Entomologist.

FRUIT GROWING.

The Growing of Olives.

Possibilities of the Industry.

J. A. BALLANTYNE,
Special Fruit Officer.

An Olive Grove.

THE question might be asked why, despite suitability of many districts and availability of information regarding varieties and cultural methods, there has been little extension of olive planting in New South Wales, or, for that matter, within the Commonwealth. There are various reasons for this. In the first place, the olive does not enter very largely into the diet of Australians, as it does in European countries, where enormous quantities are consumed, especially in the oil form and for cooking purposes. Australians are not yet olive minded. Not only do we consume much less, but are content to use animal fats for cooking rather than the olive oil. Other hindrances have been the fact that the trees take some time to reach the stage of maximum production, and the tedious nature of some of the work, especially the picking, does not have a universal appeal to Australians.

Probably the main reason for lack of interest in olive growing has been that prospective growers have, in the past, not been quite convinced that the venture would be profitable.

As far back as 1896 the New South Wales Department of Agriculture introduced a collection of olive varieties from overseas. The first consignment consisted of thirty-five varieties, and these trees are now growing and in production on Wagga Experiment Farm. The olive will live to a great age, and once the trees are firmly established their life may run into hundreds of years. The collection of varieties at Wagga Experiment Farm has been gradually added to, and there are about sixty varieties growing there to-day.

Useful Experiment Work.

Throughout the years experiments have been carried out with pollination requirements, fruitfulness, etc., and also in regard to the manufacture of oil and pickles, so that information is available as to the most suitable varieties for marketing in the pickled form or for crushing and manufacture of olive oil.

Interesting facts have been collected, especially in regard to production records,

size of fruit and oil content of varieties. A variation from eighty fruits to 500 fruits to the pound is not uncommon, and oil contents varying from as low as 23 gallons to the ton of fresh fruit to as high as 60 gallons have been recorded. Some work still remains to be done in the determination of suitability of varieties for various districts, and with this in view, varietal experiment plots have been established in different parts of the State.

Suitable Districts and Soils.

Many districts on the western side of the Dividing Range in New South Wales should prove satisfactory for the growing and production of olives. Climatically, the olive could be grown in localities as wide apart as Inverell, Narromine and the Murray River districts, but the rainfall in most portions of the State referred to, would be insufficient for annual cropping and high production, and would require to be supplemented by irrigation. The olive requires dry atmospheric conditions during summer months, and, for this reason, is less likely to be successful if grown on the eastern side of the Dividing Range. The trees could be expected to grow well in these areas, but it is doubtful if they would crop satisfactorily, and trouble with insect pests could be anticipated.

It is generally considered that soils of a loamy character and calcareous nature are most suitable. The olive can be grown in a wide variety of soils, but, like other fruit trees, for best results fertility is required. There seems to be a tendency to plant these trees in the poorer soils which, in many cases, have proved unsuitable for other fruit trees. Growing olives in these soils can only result in reduced vigour and cropping capacity.

Olives are Grown for One of Two Uses.

The growing of olives may conveniently be discussed from two angles, viz.:—

(1) Growing for pickling purposes, and

(2) Growing for production of oil.

Some varieties are dual-purpose and are suitable for both oil and pickling, but generally it can be said that for high production and quality in either of these two classes, the main varieties recommended for pickling purposes are not the best for oil extraction, and *vice versa*.

Production for Pickling.

The main varieties suitable for pickling include Sevillano, Hardy's Mammoth, Mission, Verdale and Manzanillo. These varieties vary considerably in production, but if

A Comparatively Low and Wide-spreading Tree is Desirable with Olives.

grown under suitable conditions could be expected to average annually 90 lb. of fruit per tree. When in full production trees planted at the rate of sixty to the acre should give an annual harvest in the vicinity of 5,400 lb. of fresh olives per acre. If the trees be planted closer together, say ninety to the acre, the corresponding yield per acre will not be 8,100 lb., but probably still only in the vicinity of 5,400 lb.

Pre-war, pickled olives were imported for about 9d. per lb. Fresh olives suitable for pickling grown in New South Wales at this same period returned growers a somewhat similar figure. Assuming the production of 5,400 lb per acre and sale at the pre-war competitive imported figure of 9d. per lb., the gross return would be more than £200 per acre. As compared with olives for oil purposes, picking charges would be higher, and if the fruit were being marketed through the usual channels, there would be cost of boxes, grading, freight and other incidental charges associated with marketing. If the fruit were forwarded direct to canneries, these charges would be lower.

Assuming that the fruit is being picked and marketed with charges at the higher rate, costs would be in the vicinity of £17 per ton for picking, and other costs a further £20, making a total marketing cost of £37 per ton of fresh olives, or roughly £90 per acre. Using this figure as a deduction from the £200 gross return leaves in the vicinity of £110 per acre to cover the cost of production and pickling. These figures are based on 9d. per lb. for pickled olives in bulk. It is extremely doubtful if olives will ever be imported again at this pre-war price.

Consumption Per Head is Low.

It must be remembered that consumption of pickled olives in Australia is low, but with suitable advertising, and with olives available to the consumer at a reasonable price, it should be possible to increase considerably the consumption of olives in the pickled form.

Care would need to be taken to avoid boom planting. Pre-war, Australians consumed about 1 lb. of pickled olives per annum to every twenty-five persons. Sixty acres of olives in full production would cope with this demand. Australians have not, in the past, been olive eaters, but little has been done to develop the trade, or give the public a chance to acquire the "liking" for this fruit. Assuming that pre-war consumption in Australia could be increased three times, to the extent of 1 lb. of pickled olives per annum to every eight or nine persons, and that there might be some increase in population by the time the trees came into production, this would possibly allow for planting of olive trees for pickling purposes to a total of 200 acres throughout the Commonwealth.

In recent years there has been some olive planting, mainly in Victoria, but also a few acres here, there and everywhere, and these areas, if taken as a deduction from the 200,

A Self-sown Olive Seedling in the Inverell District.

certainly do not leave any scope for large scale planting. It would appear that there is room for small scale plantings of olive trees for pickling purposes in Australia, but extreme care must be taken to ensure that such plantings are not excessive. It is not likely that Australia could develop an export trade with this product.

Growing Olives for Oil.

Suitable varieties for oil production include Boutillon, Corregiola, Nevadillo Blanco and others. Production per tree varies with these varieties, as also quantity of oil per ton of fresh fruit. Assuming that the trees are planted sixty to the acre, and that annual production per tree is 130 lb., would give a yield of around 3½ tons per acre. With crushing yielding 40 gallons of oil to the ton of fresh fruit, the oil output per acre would be 140 gallons.

Pre-war, olive oil could be landed in Sydney from overseas at about 10s. per gallon. Competing with this price, the gross return per acre would be £70. Costs of picking, transport to factory, etc., would vary considerably. Picking costs would be determined mainly by the size of the crop, being high in a light cropping year and low if the crop is heavy. However, the cost of these operations would be in the vicinity of £10 per ton, or £35 per acre, which, as a deduction from £70 for 140 gallons of oil at 10s. per gallon, leaves only £35, and at say 13s. per gallon, £56 per acre to cover cost of production and manufacture of the oil.

Before the war Australia imported annually 340,000 gallons of olive oil. To supply this demand, around 2,400 additional acres of olives would require to be planted within the Commonwealth. Within recent years there has been some planting of this fruit, and, although figures are not available, the area is probably in the vicinity of 1,000 acres. Several companies have been formed since the last war, and these have already commenced planting olive trees in different parts of the Commonwealth. Owing to low production costs in Mediterranean countries, Australia has little chance of developing any overseas trade.

Any extension of the industry should have as its object the supply of Australian requirements. It is doubtful if consideration should be given to increased population, or increase on pre-war figures of per capita consumption of olive oil. Despite the fact that olive oil, of all edible fats, is the richest in nutritive properties, it enters into competition with peanut and various other similar type oils, to a much greater extent than it did only a few years ago.

The position would seem to be that the grower would have difficulty in competing with oil at the pre-war imported figure of 10s. to 13s. per gallon. At £1 per gallon the position as far as the prospective grower is concerned would depend on the cost of manufacturing the oil. If these costs are in the vicinity of, say, 6s. 8d. per gallon, leaving 13s. 4d. to the grower, this should give him, on a 3½ ton crop, a gross return of nearly £94 per acre or £27 per ton for fresh fruit. With picking costs as a deduction, net return per acre would be about £59 to the grower. Having in mind the wait for trees to reach full production, this return would certainly not be excessive.

With oil selling at 25s. to 30s. per gallon, and a somewhat similar corresponding ratio in return between the grower and oil manufacturers, the growing of olives for oil purposes should be a worthwhile proposition.

The age at which bearing commences will vary, but for practical purposes we can assume light cropping will commence at five to six years, increasing to effective bearing at nine to ten years, and to full production from twelve years onwards.

It is possible that hormone treatment may be the means of bringing the olive tree into production at an earlier period, and also of increasing considerably the annual cropping per acre. However, until such time as the efficiency of these treatments has been proved, it would seem a risky proposition to budget for an early or higher production figure.

Cherry Varieties.

ONLY sweet cherries are grown commercially in New South Wales, and of these only a few have proved of sufficient commercial merit. They are characterised by the firmness of their flesh, their season of ripening, inherent quality and size; and in addition have the ability to withstand transport and handling. On account of this last requirement, black-fleshed cherries are preferred. The white-fleshed varieties are mostly utilised for processing.

In making a list of varieties for planting, the varieties chosen should be satisfactory from the following points of view:—

1. They should be satisfactory pollenisers for one another.
2. They should ensure a harvesting succession throughout the season.
3. They should take advantage of the special marketing possibilities of the particular locality.
4. They should be true to name and free from any off-types.

With these factors in mind, the varieties recommended for commercial cherry-growing are Early Lyons, Eagle Seedling, Napoleon, Florence, Rons, St. Margaret, and Blackboy.

The early varieties such as Early Lyons and Eagle should be planted predominantly in the early districts of Young and Lakesland. The variety Rons is becoming popular in the Young district. In the late districts the full succession of varieties may be grown, but the late varieties should predominate. These can be stored for a short time to extend the season, and have been found to carry well in the interstate trade.

Need for Cross Pollination.

Despite the fact that the necessity for cross-pollination has been pointed out by this Department for over twenty years, unsatisfactory cropping of some cherry blocks in due to insufficient or ineffective cross-pollination. All varieties of sweet cherries are self-sterile and some varieties are cross-sterile with a few other varieties. It is, therefore, necessary to plant together the varieties which are cross-fertile and also to have bees, usually one strong hive per acre, to transfer the pollen.

The need for cross-pollination should be borne in mind when selecting varieties. The recommended varieties already listed have been selected for their cross-fertility.

The compatability of cherry varieties has been investigated in this State and the results are given in tabular form below. The varieties are bracketed into groups, within which the flowering periods of the varieties will overlap one another sufficiently for pollination purposes.

Pollen Varieties.	Early Rivers.	Early Lyons.	Napoleon.	Florence.	St. Margaret.	Noble.
Early Purple Gean	...	C	...	...	...	...
Precoce de Boppard	...	C	...	...	...	...
California Advance	...	C	...	...	...	...
Centennial	...	C	...	...	...	...
Chapman	C	C	C	...	C	...
Bedford's Prolific	I	C	C	C	C	C
Black Eagle	I	C	...	...	...	...
Early Rivers	I	C	C	C	C	...
Burgsdorf	C	C	...	...	...	...
Eagle	C	C	...	...	...	...
Early Lyons	...	I	...	C	C	...
Mezel	C	I	C	...	C	...
Twyford	...	I	...	C	C	...
Rockport	...	C	...	...	...	...
Napoleon	...	C	I	C	C	C
Reverchon	...	C	I	...	...	...
Archduke	...	C	...	...	C	C
Bleeding Heart	...	C	C	C	C	C
Common Bigarreau	...	C	...	C	C	C
Florence	...	C	C	I	C	C
Werders	...	C	C	C	C	...
St. Margaret	...	C	C	C	I	I
Blackboy	...	...	C	C	C	C
Pelissier	...	C	...	C	C	C
Rons	...	C	...	...	C	C

"C" Indicates compatible varieties.
"I" Indicates incompatible varieties.

Of varieties that are grown locally, the chief intersterile groups to be avoided in planting, on the basis of the results tabulated above and overseas investigations, are as follows:—

(a) St. Margaret, Noble, Black Republican, and Black Bigarreau.
(b) Early Lyons, Twyford and Mezel.
(c) Napoleon, Bing, Riverchon (or Pelissier) and Lambert.
(d) Bedford's Prolific, Early Rivers, Black Eagle and Knight's Early Black.
(e) Early Purple Gean, California Advance, and Rockport.

MODERN TECHNIQUE IN THE CONTROL OF FRUIT PESTS

Topical Tips on D.D.T.

Although official recommendations are still based on lead arsenate there is little doubt that DDT has now proved itself to be an efficient control agent for codling moth.

Although build up of red mite, red spider mite and woolly aphid must be expected following its use, this cannot in any way detract from the efficiency and economy of DDT as the lethal ingredient for codling moth.

However when DDT is being widely used particular care must be given to the application of dormant oil sprays and a close watch should be kept on the trees' foliage so that increasing mite populations can be checked.

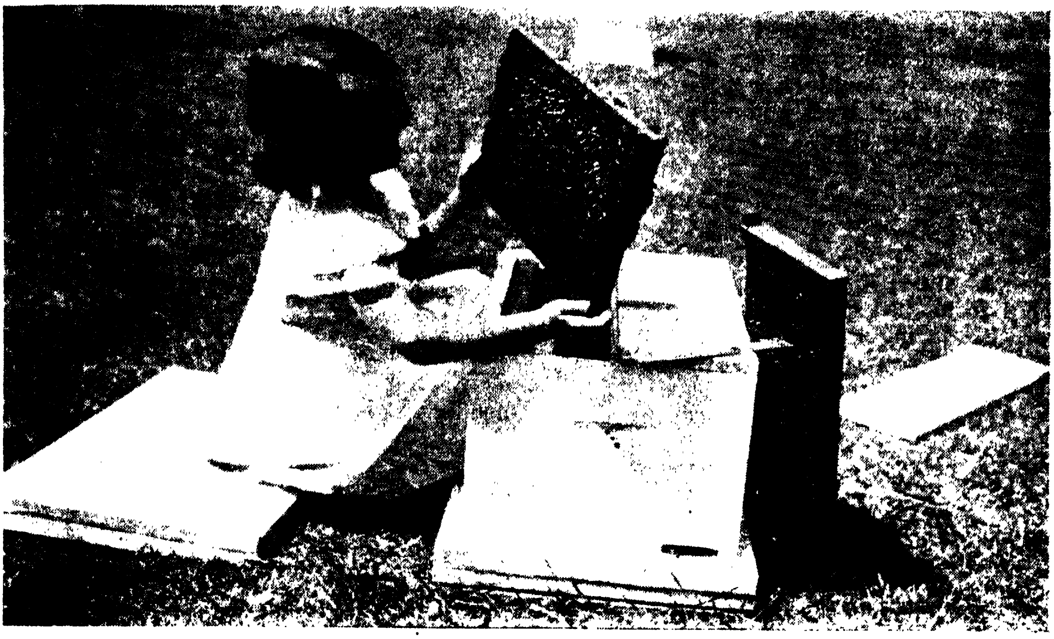
The Shell Company recommends a thorough spraying with Shell Whitespray as the most effective means of achieving this.

SHELL

SPRAYING RECOMMENDATION

SHELL SPRAYING OILS FOR ALL FRUITS AND ALL SEASONS

THE SHELL COMPANY OF AUSTRALIA LIMITED (Incorporated in Great Britain)



Who's afraid of Bees!

Beekeeping Notes.

W. A. Goodacre, Special Livestock Officer (Apiculture).

THE PROBLEM OF "DWINDLING"

Some False Conclusions.

HEAVY mortality amongst the adult hive population may result from a variety of conditions affecting the colony health. This "dwindling" of bees, as it is termed, may be attributed to various factors, chiefly those affecting the food supply.

The losses may be quite alarming at times, actually suggesting that the bees had been in contact with insecticidal sprays, such as arsenicals or D.D.T. Almost invariably, however, examination of affected bees by the Department has proved that they were suffering from digestive troubles with dysentery as a prominent symptom.

On some occasions the bee-farmer must accept responsibility, as in those instances in which the hive-covers are leaky, causing dampness in the living quarters, thus resulting in mould-growth or fermentation of the honey and pollen stores in the combs. Investigation, however, has suggested that in the main the trouble may be attributed to peculiarities of the seasonal conditions affecting the natural food supplies, particularly those from certain species of flora.

Seasonal Influences on Nectar Quality.

A number of bee-farmers who experienced heavy dwindling in apiaries on the Central Coast during the past autumn, whilst the bees were working a honey-flow from Bloodwood (*Eucalyptus corymbosa*), thought that the mortality amongst the adult bees must have been caused by the bees working flowering plants which had been sprayed. A little investigation about the locality would have disproved this assumption, as apiaries in the forest country, well

away from any agricultural activity where sprays or insecticides could have been used, were affected with dwindling in exactly the same way. It could have been observed, too, that no fruit trees and very few other plants on which sprays are normally used, were in flower at the time.

During the general run of seasons the honey-flow from Bloodwood may be worked without any effect on the health of the colonies, and bees winter well on honey stored from that species. However, it was observed during the past autumn that the nectar contained a higher moisture content, compared with the percentage of sugar, than is usually present. In an endeavour to convert this moisture-laden nectar into a properly constituted honey during a time when the atmosphere itself was highly saturated, the bees contracted severe digestive troubles. Yeast development (fermentation) had to be contended with, and this was clearly shown by the presence of yeasts in the stomach and bowel contents of specimens of affected bees examined at the Department.

Colonies affected by dwindling may be relieved by stimulative feeding of warm sugar syrup, but the best plan is to move the hives to a well-drained sunny site in a new locality, where the colonies will have better chance to recuperate.

Spraying with Poisons Often Blamed.

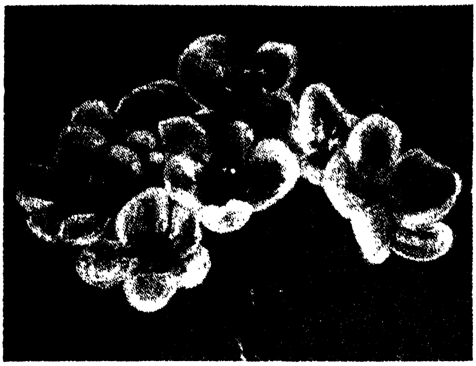
When spring dwindling occurs in the apiary, resulting from adverse conditions experienced by bees during the previous autumn and winter, or arising from other conditions affecting the health of the colonies—to be explained in more detail later in this article—there is a tendency occasionally for the bee-farmer to be suspicious that poisonous sprays have caused the mortality in his hives.

Spring is, of course, the time when orchardists may require to apply spray to their fruit trees. However, the recommendation given at all times by this Department to orchardists and other growers, not to spray their trees or plants when in flower is now generally accepted. Only on rare occasions is it found that losses in bees have been the direct result of the careless spraying of fruit trees or other plants.

It is in the interests of growers that they follow the Department's direction as to the right time to apply the sprays, not only to gain the most effective control of the pests, but at the same time not to disturb the essential pollination service which bees are specially fitted by nature to render. This pollination service is particularly valuable in the production of payable crops of pome fruits. In the apple- and pear-growing area

A Profuse Show of Blossom on a Granny Smith Tree.

Bees render a very valuable pollination service, and many fruitgrowers successfully maintain small apiaries in their orchards.



Full Blossom Stage—Too Early to Spray Pome Fruits with Arsenate of Lead for Codling Moth Control.
Spraying at this stage is dangerous to bees.

about Orange, small apiaries permanently established by fruit-growers have been successfully worked for quite a number of years. The trees in the owners' orchards and surrounding locality have been regularly sprayed, and no noticeable effect on the welfare of the colonies of bees has been detected.

Hundreds of hives of bees are moved to prune orchards in the Young district both by local and migratory bee-farmers, and both parties concerned benefit from these moves. No anxiety is expressed in regard to the application of sprays simply because a co-operative spirit should and does prevail.

It is not intended to convey the impression that there is no risk to bee life where poisonous sprays are applied to plants or trees at the wrong time, because it has been proved beyond doubt that when sprays are used during the flowering period when bees are active in gathering nectar or pollen, there is a definite danger. What we do need to avoid, however, is casting the blame on the fruit- or vegetable-grower, when actually the losses sustained in the apiary have resulted from the dwindling troubles indicated elsewhere in this article.

Watch the Water Supply.

In one instance in which a New South Wales beekeeper suffered heavy losses of field bees at a time when grass and weeds along a railway line near his apiary were heavily sprayed, it was observed, on investigation, that very few of the plants were flowering to attract bees. The trouble actually arose as a result of the water supply within reasonable distance of the hives having dried up, and the bees, in distress on this account, raided the spray to secure moisture. Bee-farmers know very well from experience that where bees can secure water from a regular source of supply they will not be attracted to any extent to any temporary source. It is important, therefore, in any areas where arsenical sprays in particular are likely to be applied, to ensure that the regularly used water supply is adequate.

Effect of D.D.T.

In another case, in which the beekeeper suspected that the mortality in his hives was caused by bees contacting D.D.T.-sprayed plants, an investigation proved that the colonies had been maliciously dusted inside the hives with this insecticide. A practical test was made at this Department, with dry combs from the supers of the above-mentioned hives. They were placed in a nucleus hive with a fresh comb and bees between them. All the bees were either dead or in a dying condition within twenty-four hours, and every symptom indicated that they were affected by D.D.T. The bees, in attempting to clean up the cells, came in contact with a heavy concentration of D.D.T., and when moving within

Calyx Stage—Correct Stage for Spraying for Codling Moth Control.
The flowers are no longer attractive to bees.

the cells became heavily coated with the D.D.T. in a way that would never occur under natural field conditions.

These cases are mentioned in order to show how necessary it is for a thorough investigation to be made before coming to any conclusion as to the cause of mortality

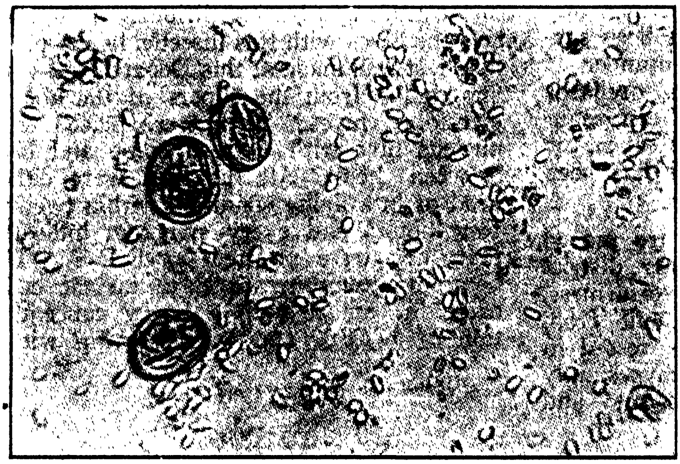
amongst adult bees, or attaching any blame to fellow producers because of their need to use sprays to combat destructive pests in the orchard or on the farm. From a close study of the matter, the writer is of the opinion that the element of risk to bee life from the use of sprays is small, and in any case could easily be avoided by a little co-operation between the bee-farmer and his fellow producers.

Deteriorated Food and Devitalised Colonies.

The type of spring dwindling referred to earlier in this article usually results from the colonies of bees having to deal with an over-wintered food supply which has deteriorated. This deterioration is due to leaving excess super accommodation on the hives, so that the bees are not able, during cold, dampish weather, to care for the honey stored above the main winter cluster. Trouble may also arise when colonies go into winter with their vitality lowered as a result of adverse autumn conditions preventing the raising of a sufficient force of young, vigorous bees. In this case the bees may survive the actual winter season but fail to establish themselves properly during spring, the heavy field work and the establishment of sufficient brood during spring being too great a task for them in their weakened physical state. In this condition the bees may also become susceptible to nosema disease caused by a protozoan, a parasitic organism which invades the digestive system of the bees.

Importance of the Pollen-Nectar Ratio.

Another cause of spring dwindling is compaction in the digestive system, which particularly affects the nurse bees. These young bees are called upon to consume large quantities of food in order to prepare chyle to feed bee larvae, and when an abundance of pollen is available, and stores in the hive and nectar in the fields are in short supply, there is a tendency to consume too much of the protein-rich pollen in relation to honey, the carbohydrate-rich constituent of their diet. In consequence, the digestive system of the nurse bees becomes clogged with pollen. The condition may be relieved by stimulative feeding with warm sugar syrup, in order to influence the bees to consume a properly balanced diet.



[*After Morison.*

Spores of Nosema Disease.
The large objects are pollen grains.

"Paralysis" in Bees.

Heavy losses of adult bees may also result from the malady known as "paralysis," but in this case only individual colonies are affected, and the trouble is more persistent than dwindling and may continue through the season. Nosema apis may or may not be associated with this malady. Where paralysis or nosema disease is present, it is essential that the affected colonies be re-queened by the introduction of young vigorous queen bees raised from stock which have not exhibited any signs of weakness in this or other directions.

"SCABBY MOUTH" OF SHEEP

(Contagious Pustular Dermatitis)

"SCABBY MOUTH" is a disease of sheep which is causing concern to sheepowners and those engaged on working on sheep properties.

The following statement issued jointly by the New South Wales Departments of Health and Agriculture sets out the causes of the disease, the methods which owners may employ to control it and the means of prevention of and treatment of human infection.

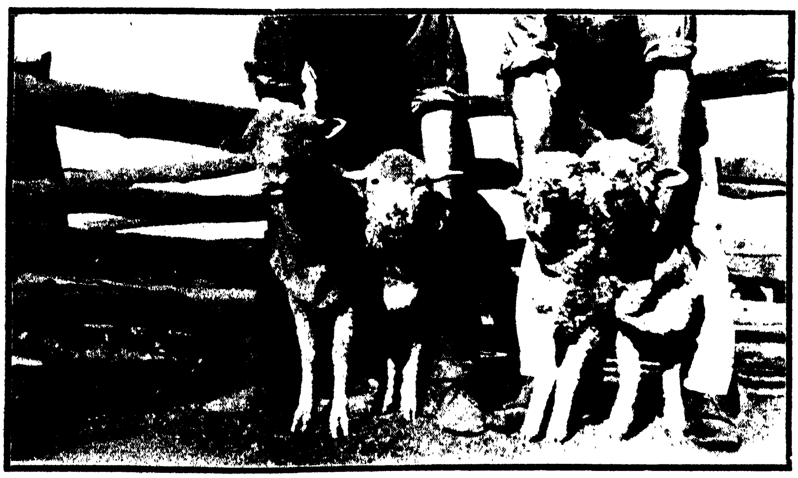
The Veterinary Aspect.

Contagious Pustular Dermatitis is a disease of sheep which is caused by a filterable virus capable of infecting the skin of the sheep in any part of its body. The disease has been known to sheepowners for many years and is frequently the cause of serious economic loss. Scabby Mouth, as the name implies, usually takes the form of pustules or scabs on the lips of lambs. These lesions prevent the lamb from readily sucking or feeding, causing the affected animal to lose condition rapidly. The lesions may be infected secondarily with other organisms or may become fly-struck, and the infected sheep may die either from these causes or from starvation.

In addition to the lip lesions, the scabs may appear on the udder of the ewes or elsewhere on the body. The disease is readily transmitted from affected sheep to sheep which have not previously suffered from the condition. Lambs are the commonest sufferers. Usually adult sheep are seldom affected, particularly when bred on a property where the disease occurs each year, because they were probably infected while lambs and have developed an immunity to the disease.

When a sheep is infected the first sign is a reddening of the affected part. This is quickly followed by the appearance of small pustules, which later develop into raised crust-like scabs. If the infection is not complicated the disease runs its course in about four weeks, at which time the scabs fall off. If the scabs are forcibly removed, or the lesions become fly-struck, the course of the disease may be considerably prolonged.

Once sheep become affected little can be done to prevent the progress of the disease, which usually runs its typical course. It is unwise to attempt to remove the scabs which form. Once an infected lamb is detected in a flock it may not be too late to vaccinate immediately the remainder in order to halt the spread of infection. An extremely efficient vaccine is now available which will protect sheep from the disease; the process of vaccination is simple and should be employed on all properties where the disease



Sheep and Lambs affected on the Muzzles with Scabby Mouth.

appears each year. Possibly the best time to vaccinate lambs is at marking time but sheep of any age can be done.

The vaccine is now obtainable direct from either the Commonwealth Serum Laboratories, Melbourne, or the Graziers' Co-operative Shearing Co. Ltd., 46 Young Street, Sydney, at the cost of 7s. 6d. for 500 doses.

Details concerning this vaccination can be obtained from Inspectors of Stock or from the Department of Agriculture, and full directions are enclosed with each container of vaccine purchased.

The Human Aspect.

The disease is transmissible to human beings. In such a case the disease takes the form of one or more small reddened areas usually on the skin of the hand or forearm. These areas are about one-eighth to one-quarter of an inch in diameter and are slightly raised above the surface of the surrounding skin. These reddened areas develop a small vesicle or blister, filled with clear fluid, and become surrounded by an inflamed area of variable extent.

If untreated, the papule may attain larger dimensions, one-half inch or more in diameter. Pain is commonly a feature and there may be a swelling and pain in the region of the elbow and the armpit. The hand usually swells and this swelling may extend to the forearm.

Fever occurs in the more severe cases, the temperature rising to 102 deg. Fahr. or thereabouts, and lasting for from twenty-four hours to several days.

Under treatment the condition usually clears up in from seven to ten days.

With regard to prevention, frequent cleansing of the hands and forearms by washing with soap and water is of the greatest value, and this should be done at least at each "smoko." All cuts and abrasions on the hands and arms should be carefully treated by the use of any of the common antiseptics, such as tincture of iodine, Friar's Balsam, tincture of metaphen, etc., as breaks in the skin are the likely portals of entry of the infection.

It is considered that attention to these measures alone, viz., cleanliness, frequent washing with soap and water, and care in the handling of infected sheep if cuts or scratches are present on the limbs of the shearer, will reduce any risk of infection to a minimum.

When the first signs of the disease appear, medical treatment should be sought at the earliest moment. Pending such treatment, first-aid measures may be applied, such as hot fomentations, compresses of lint or gauze soaked in Eusol or other hypochlorite solution, or weak permanganate of potash solution (Condy's fluid) of a deep pink—not purple—colour.

Summarised, human infection may be eliminated or reduced by the adoption of the following measures:—

(1) Vaccination of sheep on infected properties prior to shearing, particularly young sheep.

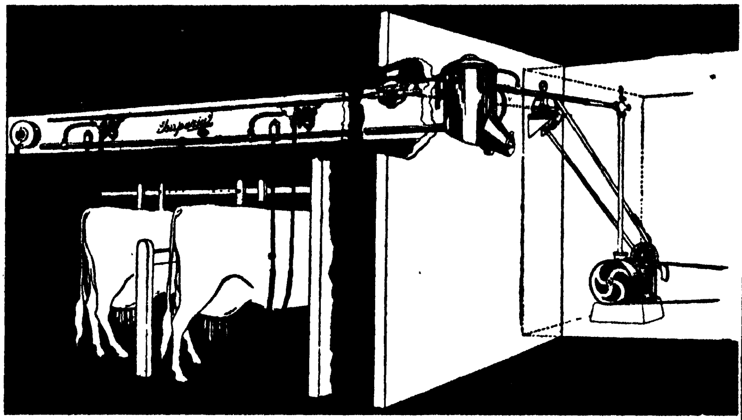
(2) The drafting off of all sheep showing disease at shearing time. These sheep can be shorn later when lesions of the disease have disappeared.

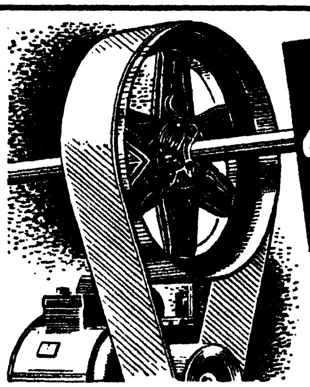
(3) Frequent cleansing of the hands and forearms by washing with soap and water at least during each "smoko," when knocking off for dinner, and at the completion of each day.

(4) Periodic treatment of all cuts and abrasions on the hands and arms of shearers first by washing in soap and water and subsequent dressing with common antiseptics.

Treatment of Cattle Diseases with Goat Serum.

"A considerable amount of correspondence has been necessitated recently as the result of the publicity given in the press to the alleged benefits in certain cattle diseases from the injection of the blood serum of mature male goats," reports Mr. W. L. Hindmarsh, Chief of the Division of Animal Industry. "This is claimed to have remarkable remedial effects in the cases of such diseases as scours of calves, mastitis and brucellosis. There is, however, no scientific foundation whatever for the claims."





FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

The Effect of—

Grazing Oats on Butter-fat Content of Milk.

NEED FOR COARSE ROUGHAGE.

G. L. McCLYMONT, B.V.Sc., Veterinary Research Officer, and R. PAXTON, Manager, Barnardo Farm Home, Picton.

GRAZING dairy cattle on young oats, with concentrates only fed in addition, seriously reduces the butter-fat content of milk—by as much as 40 per cent.—without any decrease in the volume of milk or any apparent affect on the health of the cattle.

Supplementing the grazing oats with coarse roughage—20 lb. of chaffed Saccaline per cow per day was used in the experiments described below—prevents this depression in fat content.

The experiments quoted below should not be taken as condemning grazing oats for dairy cattle. They indicated however, that, unless supplementary roughage is provided, grazing oats will, at least when fed with concentrates, depress the butter-fat content of milk.

It should, therefore, be taken as a general principle of management that with no other roughage than, say, short pastures, as is commonly the case during winter, dairy cattle grazing on oats must be given some coarse roughage. Failure to do this may result in a serious loss of income and loss of valuable foodstuffs through decreased butter-fat production, condemnation of milk by milk receiving depots or necessity to separate sufficient milk or discard fore milk in order to reach the minimum test.

The opinion that grazing oats "will give a lot more milk but no more cream" is not uncommonly held by dairymen. Following an experiment which showed that reducing the roughage content of rations below a certain level reduced the butter-fat content of milk, experiments were carried out to assess the depression of butter-fat content that occurred on grazing oats. Details of this experiment will be published elsewhere. A brief description only of the main features is given below.

An Experiment at Picton.

Twelve Ayrshire cattle in good condition and averaging nearly 3 gallons of milk per cow per day with a butter-fat content of approximately 4.3 per cent. were divided into two groups, six being fed on grazing oats (four hours per day) and concentrates, and six on the same grazing oats, concentrates and 20 lb. of chaffed Saccaline per cow per day. Concentrates were fed at the rate of 4 lb. per gallon of milk but were only eaten at the rate of 1½ to 2 lb. per gallon by the cows without any supplementary roughage. Both groups received little other feed as there was practically no pastures. The oats was aproximately 6 inches to 12 inches high, quite leafy, but far from succulent as the soil was extremely dry; they were, in fact, tending to wither.

Within a week the butter-fat content of the cattle without the supplementary roughage fell from approximately 4.3 per cent. to 2.6 per cent. with some cows as low as 0.9 per cent., the tests being carried out on composite samples of morning and evening milk. Milk production actually rose slightly

while the cattle were on the oats and their health was not affected. The cattle still chewed their cud and there was no depraved appetite for bark as had been observed the oats after about fifteen days. Both groups of cattle were then given a generous feed of roughage and the low butter-fat content of the milk of the cattle which had

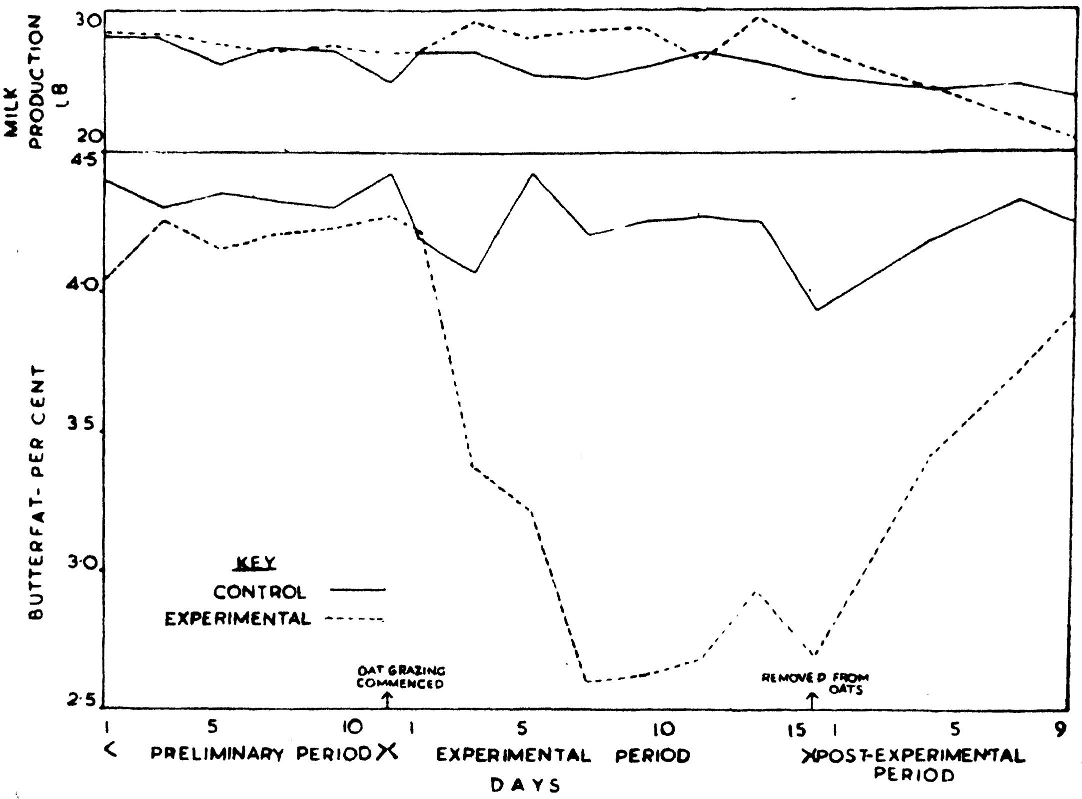


Fig. 1.—Graph showing Effect on Production of Milk and Butter-fat of Grazing Dairy Cattle on Oats.

Production of "Control" cattle, fed on grazing oats, and concentrates and 20 lb. of chaffed Saccaline per cow per day, shown ━━━━

Production of "Experimental" cattle, fed only grazing oats, and concentrates, without supplementary roughage, shown ┅┅┅┅

The graphs show:

1.—The sudden acute depression in average butter-fat content per cow, with a slight rise in milk yield per cow per day when cattle were put on grazing oats without supplementary roughage.

2.—That supplementing the grazing oats with coarse roughage practically entirely prevented this depression of butter-fat content.

3.—The quick return to normal butter-fat content when the cattle were taken off the oats and given supplementary roughage and the lack of any marked effect of removal from the oats of the cattle already receiving roughage.

in other experiments where the roughage intake had been reduced.

One cow which persistently grazed on the headlands of the paddock failed to show any decrease in butter-fat content till after she had grazed off most of the feed on the headlands and had started grazing on the oats.

It was intended to carry on the experiment for some time in order to see if there was any tendency for the butter-fat to return to normal after the initial fall but owing to lack of rain the cattle had to be taken off been without supplementary roughage quickly returned to normal. The control group which had had supplementary roughage while on the oats showed no significant rise in fat when taken off the oats, indicating that the supplementary roughage had been effective in preventing a fall in butter-fat percentage.

Practical Application of Results.

Bought roughage is usually an expensive source of food matter, costing 3d. per food unit with hay or chaff at £10 per ton as against 1¾d. for concentrates at £10 per

ton. On these grounds it has always been recommended that every endeavour should be made to supply roughage requirements by pasture grazing crops, fodder crops or farm grown conserved fodder and that buying should be restricted as far as possible to concentrates.

The previous experiment referred to above and overseas work (reported in the January issue of the Gazette) have shown that coarse roughage should not be allowed to fall below at least 6 lb. of hay or chaff per day, equivalent to about 20 lb. of green fodder or silage if depression of fat is to be avoided when hand feeding. Higher levels than this are probably necessary to prevent digestive upsets and depraved appetites. A safe level is probably 8 to 10 lb. of hay or chaff or its equivalent per cow per day.

Grazing oats might have been considered an economic source of roughage, but these experiments now reported show that by themselves they are not a satisfactory roughage for this purpose, and that some additional roughage such as hay or silage, or chaffed green fodder is necessary. Nor would short, succulent spring grazing or short overgrazed pasture be suitable.

Whether less than 20 lb. of Saccaline, equivalent to 6 or 7 lb. of chaff or hay, is sufficient to prevent the butter-fat depressing affect of oats is not yet known, but as the control cattle, i.e., those with supplementary roughage, when first placed on the oats showed a small temporary fall in fat content (see graph), the 20 lb. was probably close to the minimum.

There is no direct evidence as yet that grazing oats without concentrates in addition will result in depressed fat content, but from field observations and the relatively small intake of concentrates by the experimental cattle, it is probably the case.

The actual loss to the dairy farmer from decreased butter-fat production or from condemnation of milk of low butter-fat content because of this peculiar property of grazing oats and possibly of other cereal crops such as wheat and barley, is not definitely known, but is probably serious, as grazing oats is a major source of winter grazing for dairy cattle in this State.

In this experiment the butter-fat production was reduced by about 40 per cent. and it is possible that with the markedly lower fat content of the milk, the separator would not have functioned efficiently, resulting in a further loss of butter-fat.

Acknowledgment.

This experiment was carried out at the Barnardo Farm Home, Picton, and the co-operation of the Trustees is appreciated.

Stud Jerseys Bulls Embarking for Australia.

These animals were purchased in Canada early this year, by the Oversea Stud Stock Buying Delegation lead by Hon. E. H. Graham, M.L.A., Minister for Agriculture.

At the head of the line is Bellavista Samaritan Royal, bought for the Department of Agriculture. This bull was champion at the recent Wagga Show.

E. HADLINGTON, Principal Livestock Officer (Poultry).

Should Flocks be Culled Early?

MANY producers are in doubt as to whether they should cull the old hens heavily in the near future or hold them until production falls after the end of the year.

From the economic point of view it would appear that, except in cases where a reduction in staff would be possible if large numbers of hens were marketed, there would be practically no difference in revenue should the bulk of the hens be sold at the beginning of November or, alternately, kept until the end of January.

However, having regard to the necessity for exporting to Britain as many eggs as possible, the disposal of a large proportion of the hens before the export season is over would not be justified—and on no grounds, except shortage of foodstuffs, should wholesale culling be carried out during October.

A factor which will operate towards maintaining higher prices than usual for hens, even after the end of the year, is the export of dressed poultry to Britain, and provided that hens are not allowed to reach the moulting stage before marketing, good quality birds should realise satisfactory prices over the period when values usually decline heavily.

In the circumstances the best course to follow is to carry out normal culling between now and the end of the year, eliminating any birds which show definite indications of not laying consistently.

At the beginning of next year, it will be necessary to cull the second-year hens more heavily, and take out all which show any signs of drying up in the combs. If such birds are left they will commence to moult and their value will be reduced, as buyers do not like birds with pin feathers.

The rate of egg production is one of the main deciding factors governing culling, both before the end of the year and afterwards, and if during November and December production falls much below 50 per cent., due to no apparent cause, this would indicate that a fairly heavy culling was necessary.

During January and February production should be not less than 33 per cent., and any reduction below that figure would warrant further culling.

The procedure which should be followed before carrying out a heavy culling is to check the production from each pen of hens over a period of about a week. This will

indicate whether a few individual pens are responsible for lowering the egg yield, or if the flock as a whole requires general culling.

CARE OF THE YOUNG STOCK.

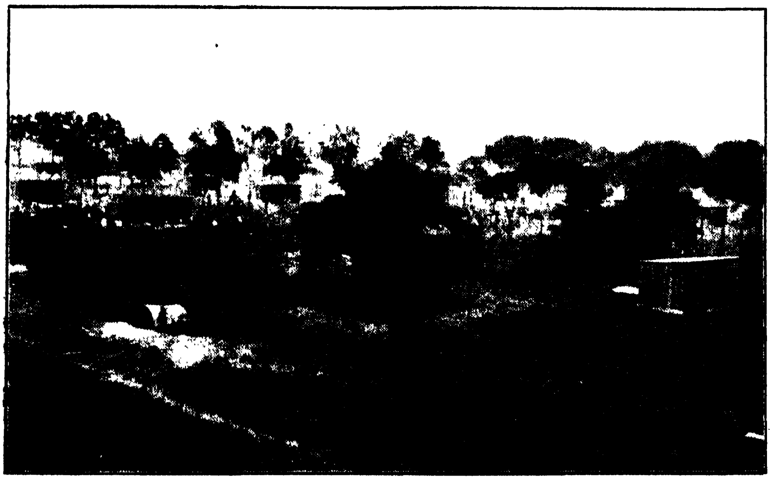
On most farms the hatching season will now be over and every farmer should concentrate on securing the maximum development of the chickens which are going through the various stages of rearing.

The present low returns place an emphasis on the necessity for obtaining the best possible growth in the young stock, as the effect of poor rearing will be felt in the profits from the resultant pullets. It is doubtful if the full significance of this matter is realised by many poultry farmers, otherwise better facilities for raising young stock would be provided.

It stands to reason that a serious setback to the chickens during any stage of rearing will lower their resistance to disease and also affect the constitution of the birds, which will result in a reduced egg yield.

One of the main factors contributing towards lack of development is overcrowding, either by placing more chickens in the pens than they will properly accommodate or running them in large batches, thus causing packing together. Other contributing causes are keeping the chickens too long in small pens, placing them in badly ventilated houses, or, on the other hand, putting them in open-fronted houses before they have learnt to roost. Again, running together widely different ages will result in the smallest birds being bullied by the larger ones, thus depriving them of their full share of the feed.

Another common cause of trouble among chickens at this time of the year is transferring them too soon from heated brooders as the weather becomes warmer. The fact is overlooked that at this time of the year a warm spell of weather is frequently followed by a wintry change, and unless some provision is made for keeping small chickens warm the result is disastrous. This is a common error which is made, not only by beginners, but also by more experienced farmers who, perhaps, against their better judgment take a risk to obviate the work entailed by keeping the chickens in the brooders a week or so longer.



A Suitable Colony System.

Using Adult Houses for Young Stock.

On many farms where no provision is made for a colony system the chickens are placed in the laying quarters direct from the weaning pens, or in some cases when they are taken from the brooders. In most cases the laying pens have not been spelled, as they are required for layers up to the time the chickens are ready to go into them. Under such conditions, it cannot be expected that maximum growth and health will be attained, especially if, as is frequently the case, large numbers of chickens are placed in the houses.

In fact, it is not safe to house young stock in batches of 150 and over, even in large houses, before the end of the summer, as they will mostly crowd in one end of the

houses, and if they escape an outbreak of disease, their growth is likely to be retarded.

Colony System Pays Dividends.

There is no doubt that the colony system is the most satisfactory method of raising chickens after they have learnt to roost and up till they are fully grown.

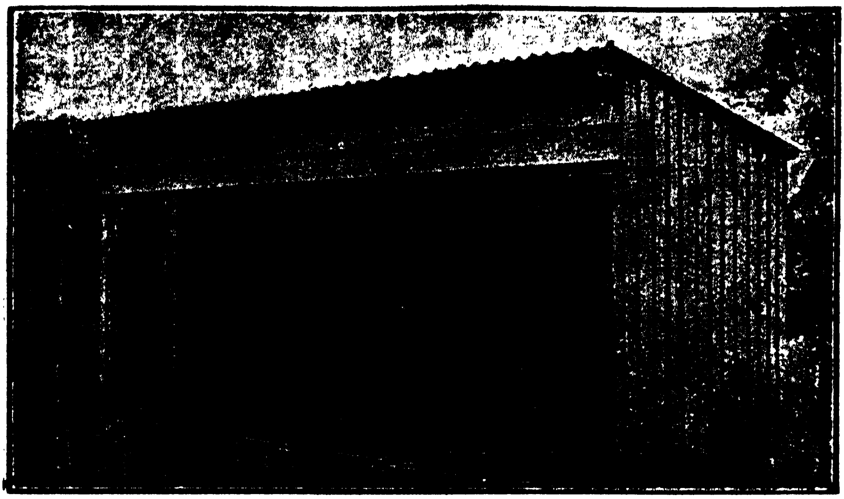
This has been demonstrated over many years both on Government farms and on many commercial farms, but to obtain the maximum benefit, adequate space should be provided and the houses placed as far apart as possible, preferably on irregular lines. To keep these runs in a sanitary condition and prevent them becoming permanently bare it is necessary to allow an acre for each 400 pullets, and to spell the runs for at least three months each year. This area works out at 100 square feet per bird, and while in dry seasons the grass may become worn off the surface, it will generally be found that after a spell of a few months the runs will grass over again. If not, the sowing of Perennial rye or Wimmera rye in April or May, at the rate of about 15 lb. per acre, will provide excellent covering which will, under the conditions stated above, last for several years on average soils.

White Leghorn Cockerels Eleven Weeks Old.

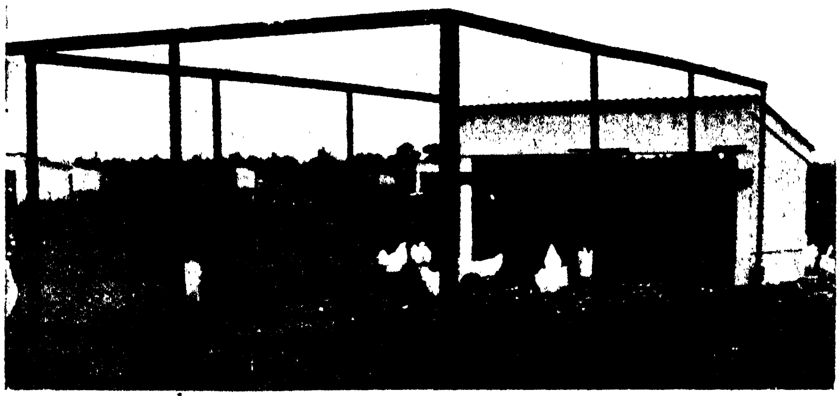
The size of houses is another important factor and these should be large enough to accommodate fifty to seventy-five pullets in each. For fifty pullets a house 12 feet long, 6 feet wide, 6 feet high in front and 5 feet at the back is required, while for seventy-five, the house may be 15 feet long by 6 feet wide and the same height as for fifty, or 12 feet long by 8 feet wide and the same height. The houses 6 feet wide should have two perches the full length of the shed, while that 8 feet wide should have three perches.

Australorp Pullets Eleven Weeks Old.

On small farms of up to 2,000 layers, about three or four houses to each run is the most convenient, but where larger flocks are kept, up to six houses may be built in each run. However, fewer houses are more easily managed and there is less risk of the birds "drifting" from one house to another. One of the most important means of ensuring that the birds remain in their own houses is to have portable enclosures to erect around the houses when each new lot of birds is transferred. The birds should be kept enclosed around the house for at least a week to accustom them to their own locality. If this is done and the chickens are fed at the furthest end of the run from the entrance gate, very little trouble will be experienced in inducing them to go back to their own houses.



A Colony House.



A Colony House with Temporary Enclosure.

A FIELD day will be held at the Poultry Experiment Farm, Seven Hills, on Thursday, 9th October, commencing at 1.30 p.m. The Minister for Agriculture, Mr. Graham, will be present and will open the proceedings.

Issuing an invitation to poultry farmers and other interested persons to attend, Mr. Graham said that brief talks would be given on experiment work and the farm would be open for inspection. Birds being used in progeny testing work, also in grain sorghum feeding trials for both chickens and adults, as well as other items of interest, could be seen by visitors. Results of experiments which had been completed recently at this Farm would be discussed by various officers of the Department.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	40
New England University College, Armidale (Jerseys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	103
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	24
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	37
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	79
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R., "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, T. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

The Imported Percheron Stallion "Kilham Commando."

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	100	30/8/47
Berry Training Farm, Berry (A.I.S.) ...	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/6/48
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Cowra Experiment Farm (Ayrshires) ..	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.) ...	59	2/8/48
Farrer Memorial Agricultural High School, Nemingah (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	259	20/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook	93	15/8/47
Riverina Welfare Farm, Yanco (Jerseys) ...	113	16/8/47
Rowntree, F. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	114	1/6/47
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)...	119	20/4/48
Yanco Agricultural High School, Yanco ...	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brodie, A. D., Naman Park, Menangle ...	49	14/4/48
Brookfield Afforestation Camp, Manrus ...	209	12/8/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, T.L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell ...	134	16/8/47
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood ...	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	57	2/11/47
MacNamara, B., "Mount View," Cessnock...	58	16/5/48
Marist Bros. College, Campbelltown ...	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville ...	21	8/8/46
O'Brien, O., "Mount View," Inverell ..	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	24	2/9/47
St. Ignatius' College, Riverview	24	7/7/47
St John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills ...	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead ...	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree ...	53	10/2/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Wallaga Lake Aboriginal Station	19	29/4/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis —

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Feeding of Pigs.

Prevention of Worm Infestation.

WORM eggs segment and produce infective forms in conditions of warmth, moisture and shade. Where feed troughs are placed on the ground some of the feed is slopped over and the pigs' sharp trotters cut into the ground surface. After completion of the feed the swine root hopefully through this slush in search of some slopped-over food. Such conditions are ideal for propagating worms.

It is a matter of common observation that on sandy soils worm infestations both in pigs and poultry are frequently heavy Although conditions of slush do not occur, it seems that the loose, sandy surface affords protection for the worm eggs which are trodden into it. To minimise the effect of the above factors, feed troughs should be placed on concrete.

Some owners lay down a sheet of concrete and in the centre of it make a bevelled depression about 6 inches deep, 18 inches wide (at the top), and as long as required. The sides of this depression are made quite smooth, and with an even slope. The feed is placed in this and after feeding is finished it can be swept out and allowed to dry in the sun

The sheet of concrete should be large enough to accommodate all the pigs as they struggle around the food. The edges of the concrete should be smoothed down and made to run several inches underground so that excavation round the edges of the concrete does not occur.—DIVISION OF ANIMAL INDUSTRY.

Avoid Wasteful Feeding Methods.

WASTE of feed represents a little considered but substantial economic loss in Australian animal industry. Neglect to conserve surplus pasture growth is of all forms of waste perhaps the most serious and the least recognised, but even feed which the farmer has gone to the trouble of growing is frequently not used to the best effect.

Too many dairy farmers put in a lot of time growing crops such as sorghum and maize from which they derive only a fraction of the crop's potential feeding value. They prepare the land well, manure it, and are continually cleaning the growing crop Then when they decide to feed it, they cut it and throw it out in the paddock, where a large percentage is wasted. The animals usually eat the flag and soft portions of the stalk and leave the rest After a month or so the farmer rakes up the residue and burns it. This is sheer waste of effort and good fodder. If these crops were fed as chaff, better results would be obtained and waste avoided —DIVISION OF DAIRYING.

Washing of Dairy Utensils.

IN washing and sterilising dairy utensils the best results are obtained when the following routine is observed:—

1. Rinse away all milky material with lukewarm water.

2. Thoroughly scrub each utensil with a brush and water which contains soap or soda or both soap and soda. The water should be hot, but not so hot as to be uncomfortable to the hands.

3. Rinse in warm water.

4. Place in boiling water for two or three minutes.

5. Drain and place in an airy position to dry quickly.

6. A sterilising solution (preferably hypochlorite) is of considerable value if used immediately before milking if it is thoroughly rinsed away with clean water.

THE AGRICULTURAL GAZETTE FOR NOVEMBER, 1947.

This Issue Contains:—

Crop Forecasts

A Valuable Service.

THE increasing complexity of modern methods of marketing primary products, particularly those exported, has created a more and more insistent demand for reliable forecasts of crop yields. Great shortages of food in large areas of the world during and since the war have added to the significance of estimates of food crop production.

Such forecasts are normally of immense value, not only to farmers and their organisations, but also to merchants, transport services, financial institutions, machinery manufacturers and many others interested in handling the farmer's products and supplying his needs—in total a large section of the community. At present, they are also of vital concern to those planning the relief of the peoples of countries short of food.

It is thus evident that to serve its purpose, the crop forecast must be as accurate as possible—indeed, if it is not, the result may well be ultimately to cause hardship to those concerned in the utilisation and marketing of the particular product. For this reason, the Hon. E. H. Graham, M.L.A., Minister for Agriculture, was careful to emphasise that the official preliminary forecast of an all-time record yield of 120,000,000 bushels of wheat from 5,550,000 acres for the current season, estimated on conditions obtaining at 10th October, was based on the most reliable information possible to obtain. The same exhaustive search for comprehensive and accurate information will be made in connection with a second forecast, based on later conditions, which will be issued during the month of November.

Probably few people realise the tremendous task of surveying such a large area as 5½ million acres, spread over more than 18,000 farms, and of the importance of careful estimation of crop yields if the calculated area and State yields are to be reliable. An error of even 1 bushel per acre would make a great difference with such a large acreage.

As the basis of its forecasting activities, the Department draws upon such services as its own technical field officers, hundreds of selected crop recorders and the Bureau of Statistics, and in the case of wheat, in a further effort to reduce the margin of error to a minimum, considers the views of the Grain Trade Section of the Chamber of Commerce.

Farm crop correspondents carefully selected for suitability to the task and for situation at localities that will give accurate

coverage, play a very important part in this assessment of potential yields. Their reports are carefully analysed, together with those of district officers, in arriving at an overall average per acre in relation to each area. It is recognised that much of the accuracy of crop forecasting is dependent on the judgment of individual crop reporters. For this reason, it is the practice to utilise as large a number of reporters as is practicable in relation to each crop.

Although many circumstances impossible to foresee—rain, heat, hail, fire, flood, pest and disease—may eventuate and upset the most careful calculations, the task undertaken by the Department is to issue a forecast that is as accurate as is possible. This it does in relation to a number of crops, and issues them at times calculated to be of most value to those who have use for them. It is constantly seeking for ways and means of increasing the efficiency of this service.

Courses for Ex-servicemen at Government Experiment Farms.

Alteration of Dates.

THE decision to conduct an additional refresher course in farm management for ex-servicemen, commencing on 17th November, in order to preserve the continuity of the rural training programme, as announced by the Hon. E. H. Graham, M.L.A., Minister for Agriculture, has made it necessary to alter the dates on which the subsequent courses will begin.

Ex-servicemen who have applied and been accepted for these Courses should note the changes of date as indicated below:—

Course Number.	Commencing Date.
2A	17th November, 1947.
3	2nd February, 1948.
4	5th April, 1948.
5	7th June, 1948.
6	9th August, 1948.

As an example, Number 3 Course, which was set down to start on 5th January, 1948, will now start on 2nd February, 1948.

The syllabus for these Courses has been prepared by officers of the Department of Agriculture, and embodies suggestions by the trainees who have attended previous Courses. The following specialist groups are available, and are taken in conjunction with the general syllabus:—Sheep and Mixed Farming; Pig; Dairying; Horticulture; and Poultry. The general section covers such subjects as farm management, elementary veterinary science, crops, pastures, soil, etc., while in addition visiting lecturers cover many subjects of general interest to the man on the land, such as soil conservation, and farm water supplies.

Ex-servicemen will find that these Courses will bring them right up-to-date in regard to the developments that have been made while they were with the Forces. Experts are in attendance at these Schools to answer the individual questions of trainees.

Number 3 Course is now filled, but vacancies exist for the other Courses, and those interested should apply to—

The Deputy Co-ordinator Rural Training, N.S.W.,
Department of Agriculture,
G.P.O. Box 36A,
Sydney, N.S.W.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1947.	
Bangalow	November 12, 13
Nimbin	November 19, 20
1948.	
Guyra	February 13, 14
Bundarra	February 14
Inverell	February 20, 21
Newcastle (P. G. Legoe)	February 25, 26, 27, 28
Dorrigo (W. Tomlinson)	February, 26, 27
Bega (Jas. Appleby)	February, 26, 27, 28
Armidale	February 26, 27, 28
Tenterfield	February, 26, 27 28
Walcha	March 2, 3
Glen Innes	March 2, 3, 4
Uralla	March 5, 6
Manilla	March 5, 6
Warialda	March 5, 6
Tamworth	March 9, 10, 11
Bingara	March 10, 11
Quirindi	March 13, 14
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Bellingen (C. P. Franey)	April 12, 13
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Boggabri	April 20, 21
Narrabri	April, 23, 24

INCREASED FOOD FOR BRITAIN.

Appeal by the Hon. E. H. Graham M.L.A., Minister for Agriculture.

Recommendations by Industry Committees.

THE Hon. E. H. Graham, M.L.A., Minister for Agriculture, has launched an appeal for the co-operation of all who can play any part in stepping up production of, and increasing the export of foodstuffs to Britain.

The appeal was inaugurated at a Conference convened by the Minister and attended by representatives of primary producing interests and related bodies, held in the Rural Bank Building on 3rd October.

Opening the Conference, Mr. Graham said that only by the long fortitude and self-sacrifice of the British people—now facing rationing more drastic than ever before—had it been possible for Australia to escape the ravages of war. Only by the expenditure of the last ounce of effort on behalf of our kinsmen overseas in their present extremity could we feel in any way easy about that debt.

Never in modern history, said the Minister, had there been a food prospect so desperate as that which faced the people of Europe during the coming winter, and his appeal to increase our contribution towards relief of the situation in Britain was directed not only to primary producers, but to all who could play a part, directly or indirectly, in the production of food—manufacturers, distributors, men in factories, men on wharves—all, in fact, whether they were employers or employees, who had any British sentiment.

The attendance at the gathering of representatives of both farmers and others interested in the State's great primary industries, said the Minister, was an expression of a common determination—that no avenue likely to lead to a greater supply of food to the British people should remain unexplored.

At the Opening of the Conference.

Left to Right.—Dr. R. J. Noble, Under Secretary and Director, Department of Agriculture; Hon E. H. Graham, M.L.A., Minister for Agriculture (who convened and opened the conference); Mr. C. R. McKerihan, President of the Rural Bank; Mr. P. Kearns, Commissioner of the Rural Bank.

[*S. M. Herald photo.*

The most important contribution which Australian primary producers could make to improve Britain's foreign exchange position said Mr. Graham, was by increasing our exports of those types of foodstuffs which Britain had otherwise to purchase from countries outside the sterling bloc. The first emphasis in United Kingdom needs was on wheat, fresh and tinned meats, butter and eggs. Britain would be in grave difficulties for many years to come, and producers need have no fear that their expanded production would not find a ready market.

In a detailed review of the position and the lines of action which seemed to him to warrant particular consideration, the Minister emphasized the importance of feed in potential production of meat and dairy products. It was significant, he pointed out, that the total production of the State's dairy herds in a good season was nearly double that obtained in a bad one.

The formation of local food committees and the arrangement of local food conferences to examine all possibilities likely to lead to an increase of dairy products was suggested by Mr. Graham. The record of achievement of District War Agricultural Committees he said, was proof of what could be accomplished by such means.

Conference sub-committees, representing the various branches of production were appointed, and reported back to Conference on what appeared to them the most effective means of bringing about the desired increase in the output and flow of food.

The recommendations submitted to the Conference by the various sub-committees, and adopted by the Conference are given below:—

Wheat and Wheat Products.

General.—As a general principle it is considered that there are two main methods of increasing food supplies to Britain—

(*a*) By adjustment of rations or quotas.

(*b*) By increased production.

Recommendations.—

1. That concessional sales of wheat cease forthwith except for wheat sold for local human consumption; all other wheat to be sold at export parity.

2. That the United Kingdom be given first option of all wheat supplies available from Australia.

3. To ensure continuity of maximum production a guarantee of a minimum payable floor price for a reasonable period of years should be provided.

4. That no substantial increase in production can be expected until labour, machinery, material and equipment are available and organised to harvest the existing crop, and increase the area under production during the period of emergency to keep the industry at a constant peak of production.

5. That every effort be made to maintain and increase the efficiency of the handling and transport facilities.

6. That leaders of the wheat industry appeal to growers to maintain efficient production to their maximum capacity, not only in wheat but in all forms of production.

Meat (Fresh and Tinned).

Pig Meats.

Of all the meat-producing animals the pig can give the greatest rapid increase, and subject to satisfactory feeding and management, the pig population can be expected to be increased in a relatively short time. This increase would depend on:—

(1) *Adequate food supply.*—This implies a liberal allocation of grain (preferably wheat) to pig raisers. (Consideration must be given to the question of whether Great Britain would prefer wheat to pig meats.) The Committee recognises that other grains such as grain sorghum might be available.

(2) *Adequate Return.*—The price paid for pig meat must be commensurate with the cost of the grain. It is suggested that the wartime price of 9d. per lb. when wheat was 3s. 9¾d. per bushel at terminals should be the basis of the price allowed. It may be necessary to adjust export prices.

(3) *Continuity of Markets.*—Considerable capital outlay would be incurred if the production was greatly increased and continuity of markets would be necessary to cover capital outlay.

(4) *Supplies of Fencing, Building Material and Equipment.*—The need for these to bring pig premises into order and to extend yards and pens is obvious if there is to be any increase in production.

(5) *Breeding Stock.*—Stud breeders should be encouraged to make available sufficient well-bred pigs to raise the standard of nondescript herds to export standard.

Mutton.

(1) It is recommended:—

(*a*) That an appeal be made to graziers to send in as many sheep as possible to meat works for treatment for export on a weight and grade basis.

(*b*) The Railways be requested to carry such sheep at a concession rate (*i.e.*, the rate before the introduction of the recent freight increase).

(c) The Meat Works be asked to make concessions in their rates for treatment of such sheep.

(2) Graziers be recommended to increase or to at least maintain crossbred fat lamb production, seeing that the meat price is assured for many years to come.

(3) The Committee feels that the prospects are bright for the development of the export meat trade and every opportunity should be taken to build up our exports to Great Britain with a view to the future. The greater use of the Downs breeds in suitable areas is recommended.

(4) The Committee is of opinion that there should be a drive to reduce the losses of sheep from disease.

Beef.

This State is largely dependent on Queensland and Northern Territory for its beef cattle supplies, and until travelling conditions have been improved to enable a *continuous* flow of cattle to come in, New South Wales will be handicapped by adverse seasonal conditions on the routes.

The despatch of cattle direct to Meat Works for slaughter for export on the weight and grade principle as outlined for sheep could apply equally to cattle.

Poultry Meats.

The Committee had not time to discuss this subject, but considers that much of the comment regarding pig meats will apply to the production of dressed poultry for export.

General.

It is further recommended that the Federal Government be asked to reconsider the meat ration, with a view to reducing it to a minimum compatible with the health of the community, so that more meat will be available for export to Great Britain.

Egg Committee.

The Present Position.

The Committee considers that the immediate problem is to prevent a further decline in production in order that exports will not be further reduced. To do this it is imperative that egg prices be increased forthwith. The egg industry orders 13 and 14, issued on 25th August, 1947, which created a category for washed eggs, have resulted in inequitable treatment between producers without any increase in the packings for export, and should be withdrawn. It is agreed that the segregation of washed and unwashed eggs is essential and this can only be achieved by the full co-operation of producers, which is not being obtained by the present orders.

Factors in Increasing Exports Next Year.

To increase exports next year without restricting local consumption it is necessary to increase overall production.

This might be effected by the following methods:—

1. Ensuring adequate feed supplies.

2. Revision of prices of eggs for both local and overseas trade to enable the producers to obtain a fair margin over cost of production.

3. By encouraging autumn hatching to provide additional quantities of eggs in the spring and early summer for the local market, thus making available suitable eggs for export.

4. By continued education of poultry farmers in the production of high-quality eggs.

Further Expansion in Future Years.

The Committee considers that production of eggs in this State can be greatly increased to meet the requirements of the local market in full and at the same time provide much larger quantities for export to Britain.

In addition to the measures already suggested which must be continued, we recommend that the expansion programme be based on the following broad outline:—

1. An assurance of an export outlet for all surplus production of suitable quality eggs at prices correlated with cost and production. It is pointed out that the present export contract price is fixed up to December, 1949, and the producer has, therefore, no safeguard against increased cost of production.

2. Other measures are improved transport facilities to provide for quicker and safer transport of eggs between points of production and marketing.

3. Provision of efficient refrigeration in transit over long journeys and also at all handling floors.

4. Improved facilities on handling floors to expedite the delivery of eggs to the consumer and to ensure more efficient handling. Modern machinery is believed to be available in other countries regarding which enquiries should be made and if obtainable assistance should be given by the proper authorities to import.

5. The industry is likely to be restricted in expansion by shortage of essential materials and equipment and every endeavour should be made to facilitate the availability of such supplies.

Dairy Produce.

1. A price not only covering fully ascertained cost but with a reasonable incentive added, must be the fundamental basis upon which to build a programme of increased production.

2. The encouragement of better feeding methods by every means possible. One method of better feeding is that special attention be given to prenatal care.

3. Targets should be given each factory by the State Department of Agriculture, through the Dairy Instructor in each district, and local committees set up to allot targets for individual farms and to indicate ways and means to achieve these targets.

4. Consideration to be given to production competitions through factories and in districts, and on individual farms.

5. The Cream Restriction Order should be continued and steps taken to have it enforced.

6. Every step should be taken to increase production of materials required, namely, fencing materials, irrigation requirements and other necessary dairying materials, and the setting up of machinery whereby priorities can be given to enable production to be stepped up.

7. That steps be taken to provide supplies of lime delivered at farms at much cheaper rates than those at present ruling.

8. That the Report prepared by the N.S.W. Rural Advisory Committee for submission to the Premier of N.S.W. at the end of 1944 be made available to this Committee.

9. Co-ordinated action in the matter of water conservation and administration, and extension of the activities in this regard to enable extension of irrigation schemes, particularly small undertakings, and to overcome anomalies that exist in regard to local government authorities.

10. Dairy Industry to be given number one priority for protein-rich concentrates.

11. That priority be given to people in the United Kingdom desiring to come to Australia to work in the dairying industry.

12. That an endeavour be made to survey those farms which have ceased to produce, and where desirable, an attempt be made to bring them back into production.

13. That the committee appointed by this Conference remain in force for at least three months.

Surplus Animal Feedstuffs.

General.—

Britain has intimated that she desires surplus animal foodstuffs, not required locally for meat, butter or egg production. Such must necessarily be concentrated to save shipping space; therefore, grains, milk products and possible oil meals may be available.

Recommendations.—

1. That export licenses be granted for the shipment of such products, including sorghum and other grains suitable for feeding stock.

2. Because it is uneconomic to cut clean and valuable wheat crops for hay, we urge that efforts be made to organise on a large scale, economical contract hay baling with pick-up balers to conserve the large quantities of valuable surplus natural pasture for stock feeding in dry periods.

3. That during the period of high prices for grain Governments should subsidise its cost to poultrymen, pig breeders and other stock fatteners from the Treasury.

4. The Committee considers that cereal hay making will only be carried out provided prices are made remunerative, and that labour, machinery, material and equipment are available and organised to harvest the growing crop and future crops during the period of emergency to keep the industry at the peak of production.

Fresh Fruit and Dried Fruit and Vegetables.

Pome Fruit.

Apples.—It is understood that the British Ministry of Food has made arrangements for the importation of apples during the coming season from Australia and New Zealand. Present indications for apples in all States point to a heavy crop, provided satisfactory growing conditions prevail.

Pears.—Crop prospects are fair to good. These fruits could be exported provided the British Government will permit export, and refrigerated shipping is available. It is understood at the present time that the British Government is not contemplating the importation of pears from Australia.

Citrus Fruits.

The export of fresh citrus fruits from New South Wales to England is not as favourable as from South Australia and Western Australia, but export of pure juice could be considered with advantage.

Canned Fruits and Jams.

Juices.—Recommended that the position in relation to the export of pure fruit juices to England be ascertained, as the production of juices could be greatly increased, especially in relation to citrus fruits. In the event of pure fruit juices being required, the question of containers must be considered. The release of tinplate or 4-gallon lacquered steel drums might be considered.

Canned Fruits.—The canning of peaches, apricots and pears might be increased.

Jams and Marmalade.—The production can be increased.

Tomato Pulp and Puree.—The production of these products can be increased if required.

Containers.—The quantity of canned products is dependent upon the supply of tinplate. Up to the present the Tin Plate Control Board has made tinplate available to meet requirements, but if production is to be stepped up, further supplies of tinplate will be required.

Dried Fruit and Vegetables.

Dried Fruit.—It is understood that the British Government has already agreed to take all the available dried fruit. It is impossible to increase production greatly as the quantity available for export will depend mainly upon crops and satisfactory weather conditions.

Dehydrated Vegetables.—It is understood that the British Government is not particularly interested in dried vegetables other than potatoes. However, if required, a number of different vegetables could be dehydrated and exported. It is believed that dehydrated potatoes may be required; if so, the product could be produced, as present indications are for a good crop of potatoes in most States.

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General—Shipping, Packing, Materials, Etc.

The Committee recognised that important contributing factors affecting the present ability of this country to ship foodstuffs to Great Britain were shortages of—

(*a*) Tinplate.

(*b*) Case timber.

(*c*) Timber for the making of frames and hives in the bee-keeping industry.

(*d*) Fillers required for export packs of eggs.

Mentions were made also of the shortages of refrigerator space and shipping, of the difficulty in obtaining suitable paper, wrappings and labels for fruit and tinned jams, of the impossibility of expanding honey production without suitable timber being available for hives and frames, of egg-industry requirements in timber shooks in connection with the export of eggs to Great Britain.

Finally, the Sub-committee prepared the following recommendations:—

1. It desired to draw attention to the fact that no allocation of tinplate had been made to the honey-producing industry, so that honey could be prepared in tins and forwarded in gift food parcels to Great Britain. For this purpose it recommended that some such allocation should be made.

2. Recommendation was made that arrangements should be made either to specially import, or to allocate from existing imported stocks, suitable timbers for hives and frames.

3. Whilst recognising that the question of importing timbers, fillers, case material, tinplate, paper, etc., from dollar countries was tied up with high Commonwealth financial policy, the Committee desired to stress that top priority should be given to importation of these raw materials.

4. Apart from questions of overall industry shortages of material, the Committee recognised that temporary shortages do occur connected with distribution, bottle-necks, and so forth. It felt that much was to be gained by individual firms, persons or industries making use of the assistance of the Department of Agriculture, so that by official inquiries and representations some solution might be found to these shortages.

Area Conferences Arranged.

At the conclusion of the conference Mr. Graham announced that it was the intention to convene area conferences.

Arrangements have since been made to hold "Food for Britain" conferences at Kempsey (on 14th November), Wagga (21st November), Lismore (28th November), and Bathurst (probably 5th December). Preliminary organisation for these gatherings is well in hand. They should prove an effective means of placing before country people, the recommendations made by the industry committees and enabling them to assist in implementing ways of producing the utmost efforts to increase the production of foodstuffs for export to Great Britain.

New M.I.A. Agricultural Extension Service.

An Experiment in Decentralisation.

"The new Agricultural Extension Service for the Murrumbidgee Irrigation Area represents an entirely new approach to the problem of decentralisation of the activities of the Department of Agriculture and the implementation of closest co-operation with producers through their representatives in the individual regions of New South Wales," stated the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) when referring to the new service recently officially inaugurated at Griffith.

"It is noteworthy that the M.I.A. has been chosen as the first area in which this policy has been applied practically. During the war years the M.I.A. was responsible for primary production up to the value of approximately £3,000,000 annually and this magnificent contribution will be long remembered," said Mr. Graham. "However, as we are all aware, he continued, "the cessation of hostilities has not lessened the need for maximum effort in the food-producing industries."

The M.I.A. Agricultural Extension Service formed a new unit within his Department, said the Minister, and certain experienced officers of the C.S.I.R. were being loaned to the Department to assist in staffing this new unit. A number of the Department's own officers had already been allotted to the new service, and it was hoped in due course to be able to appoint additional field officers to take part in this important work.

The Minister pointed out that from the Department's point of view alone the new organisation represented an excellent means of facilitating team work by its officers in this area, who were each concerned with different phases of the local agricultural problems. In addition, the Irrigation Research and Extension Committee which had been established in conjunction with the new service would be a valuable means whereby the Department could readily obtain farmer opinion in connection with the development of research and educational policy. This Committee would also act in an advisory capacity to the C.S.I.R. Research Station at Griffith and to the Department's own Stations in the area.

Trends in Synthetic Fibres

A. R. PENFOLD, F.A.C.I., F.C.S., Director of the Museum of Technology and Applied Science, Sydney.*

WHEN I addressed you on the technical aspects of synthetic fibres three years ago I divided the subject into three phases, viz.:—

1.—The protein fibres—represented by "keratin" from waste chicken feathers, "albumen" from egg waste, casein from skim milk (known in America as "aralac," and in Italy as "lanital") and soybean.

2.—The rayons—made from cellulose derived from wood.

3.—The chemical fibres—represented by nylon.

Since then a new fibre has been introduced. It is called "ardil," and is made from peanut protein. It approaches wool more closely than any other synthetic protein fibre. Textiles of this new fibre in admixture with 50 per cent. wool are indistinguishable from all-wool articles.

The Protein Fibres.

In considering these protein fibres it has to be admitted that whatever merits they possess, the food situation throughout the world is such that all protein substances for some time to come will be in relatively short supply for industrial purposes. In this connection the recently announced project of the British Government for planting 3¼ million acres of land in East Africa under groundnuts (peanuts), costing 25½ million pounds sterling, confirms this view. Incidentally, this is an indication of how the United Kingdom is viewing the world situation with regard to oils and fats, which I believe will be serious for at least ten years. By 1951 this area should yield 600,000 tons of peanuts per annum, from which should be obtained 250,000 tons of oil (edible oil or margarine) and 350,000 tons of protein residue, suitable for cattle feed. Should there be a surplus over that required for cattle feed, the 350,000 tons of protein residue would be equivalent to 300,000 tons of pure protein for conversion into fibre.

Continued Progress with Rayons.

The next great development has been the continued progress with rayons. The textiles made from this fibre in association with wool are becoming better and better. A striking exhibit has just been arranged in the Museum of Technology and Applied Science. It shows a magnificent range of textiles made from approximately equal parts of rayon and wool by the famous firm of Courtaulds Limited, England. An interesting feature is the novel effects obtained in the dyeing process, where wool takes the dye and rayon does not. There is no question that the production of rayon has proceeded by leaps and bounds, for next to cotton it is the most widely used fibre in the United States to-day. The production to-day of rayon fibre is approximately two billion pounds of which the United States contributes 854,000,000 lb.

Incidentally, you might be interested to learn that the remarkable developments made during the war in synthetic rubber tyres is attributed in great measure to the replacement of cotton for the treads by a special grade of rayon. This high tenacity rayon solved the problem of the "heat build up" in the large-sized tyres, with the result that cotton has been practically displaced for that purpose. I need not enumerate the many technical reasons for the superiority of this rayon over cotton, beyond stating that the life of a normal set of tyres which is usually about 20,000 to 24,000 miles, will in future be about 40,000 miles.

Nylon is Still the Greatest Fibre.

Nylon is still the greatest fibre, whether it be natural or artificial. You are aware of its military use for parachutes and tow-ropes for gliders; you know, too, that the fibre to-day is used primarily for ladies' hosiery, although few women in Australia can boast a pair. The normal demand in the United States for ladies' hosiery is about 23,000,000 lb. weight. This quantity will make 450,000,000 pairs of stockings, i.e., sufficient to supply eleven pairs for

* Notes of an address given to delegates to the Agricultural Bureau State Conference, 1947.

each of the 40,000,000 women in that country. The Dupont Company is of the opinion that the market for nylon for ladies' hosiery will be more or less saturated by the end of the present year and it is planning to step up production to about 54,000,000 lb. weight, and possibly to 70,000,000 lb. weight, by the end of 1948. It is proposed to enter the wool and cotton field.

At present over 600,000,000 lb. weight of wool and over 4,800,000,000 lb. of cotton textiles are put on the market each year. It is not thought that nylon will eliminate the sheep ranch and the cotton plantation from the American scene, but there is plenty of room for expansion. The Dupont idea is to blend nylon with natural fibres, and thus make it popular in new styles and products. Sweaters made of half nylon and wool can be given an ordinary washing without shrinking. Men's socks are also being made and sold of 65 per cent. nylon and 35 per cent. wool. They will stand ordinary washing and wear twice as long as pure wool. Pure nylon socks are light and stand extra hard wear. Tropical weight suitings of 25 per cent. nylon and 75 per cent. wool are said to look like the finest worsteds, and are light and tough wearing. Overcoats with as little as 20 per cent. nylon will not wear out quickly at the cuffs and lapels.

Seaweed Rayon as a Carrier for Fine Wool.

Another revolutionary development is the use of seaweed rayon in association with wool and other fibres. This seaweed rayon can be spun in much the same way as rayon. It possesses one great disadvantage—garments made from it will not withstand the ordinary wash. This property, at first a serious disadvantage, has since been put to profitable use, for the seaweed fibre can be used to support fine wool threads during weaving and knitting, and after finishing, leave an all-wool fabric of the lightest practical weight. It is practicable in this way for textiles of 100's worsted counts like scarves, etc., to be spun from 56's or 64's quality wool. Similarly, cloth of Astrakhan type can be produced, as well as open-work effects, by using seaweed rayon in association with wool. These revolutionary developments where the seaweed rayon acts as a carrier or support have undreamed of potentialities, especially for wool, but unfortunately there is very little commercial production to-day.

The Future of Wool and Fibres is Closely Linked.

The world demand for food and clothes must obviously exert considerable influence in the development of fibres, whether natural or synthetic. It makes wool relatively safe for a few years, for the demand greatly exceeds the supply. On the other hand, to use an animal for the production of wool is a very inefficient way of making a fibre, unless, of course, you have a dual purpose animal which provides both fibre and food. At the same time man can produce fibres of uniform properties and fineness. Moreover, synthetic fibres are not subject to seasonal fluctuations and other natural influences. Price stability has tremendous economic advantages which the synthetic fibres possess and wool does not.

Briefly the situation is as follows. The future of wool and synthetic fibres is closely linked. All modern textiles will be made of blended fibres, for it will be impracticable otherwise to meet the increasing demand for clothes by all peoples in all countries. A classic example, which is indicative of modern trends, is the intrusion of nylon into the wool and cotton fields, such as I have just described.

Value of Combining Farm and Factory Production.

In conclusion, I should like to emphasise the importance of a rayon factory in Australia. The last time I was here I urged you to encourage such an industry. I pointed out that the increased use of synthetic fibres meant a greater demand for wool; a flourishing rayon industry would not only use larger quantities of wool, but would provide new avenues for the training and employment of many skilled operators.

The war has emphasised the value of combining factory and farm production, an economic feature of considerable value to Australia. There is not the remotest chance of over-production for many years ahead, more particularly with such agricultural products as peanuts and soybeans. Both plants can be used as required for either food or textiles.

Skimmed milk is not only a useful raw material for plastics, adhesives and fibres, but its content of milk sugar provides a useful raw material for chemical industry. It is now practicable to convert milk sugar into the transparent plastic known to you as "perspex" or "acrylics."

Similarly nylon, which is normally made from coal tar products and, incidentally, from petroleum during the war, has recently been made from furfural, a chemical obtained by the chemical treatment of waste corn cobs. Just think of the wizardry of the modern chemist, for it is now practicable to go from waste corn cobs to nylon stockings!

Although to-day we look to coal and petroleum as our principal sources of raw materials for chemical industry, the day may yet come when it will be more economical for Australia to use many agricultural products for these purposes.

Additional Cornsacks for New South Wales.

A TOTAL allocation of 60,000 bales of cornsacks, capable of holding approximately 54 million bushels of wheat, is now to be made to New South Wales.

This statement was made by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), after a further conference in Melbourne with the Chairman of the Australian Wheat Board (Mr. Perrett).

"This allocation of cornsacks," said Mr. Graham, "together with the usual bulk handling facilities and the emergency storage we are providing, should go a long way towards enabling the enormous State crop to be handled satisfactorily." Mr. Graham said that the extra bags were being obtained from India, in view of the Australian record crop, as an addition to the quota previously allotted to Australia. Owing to the shipping position, all of these sacks would not be available before the harvest. The 36,000 bales previously allocated to New South Wales would be distributed within the next few weeks, and subsequent arrivals from Calcutta would be 4,000 bales in early December, 10,000 bales in the middle of January, and the remaining 10,000 bales by the middle of February.

"I again want to emphasise the enormous proportions of the current crop, which will represent a 50 per cent. increase on our previous all-time New South Wales record, and is greater than the total estimated yield of all other States," said Mr. Graham. "It is, therefore, most essential for growers to co-operate with the authorities in order to ensure that the wheat is handled properly." To do this, it would be necessary for growers to hold some of the wheat on their farms until the sacks became available from India and in this way, it would be possible to avoid confusion. The Minister said he would continue his efforts in providing temporary storage and bulkheads to meet the position.

Second-hand Sacks.

"It is most pleasing also," said Mr. Graham, "that the Wheat Board has agreed to relax its policy this year, to enable growers to deliver wheat in sound second-hand sacks. Growers will only be allowed to deliver wheat in these second-hand sacks when their supplies of new sacks have been exhausted. This concession will, however, provide some measure of relief this year when growers are looking for every means of handling their wheat. The sacks must be in sound condition and capable of being stored for a fair period."

Approved Vegetable Seed—November, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

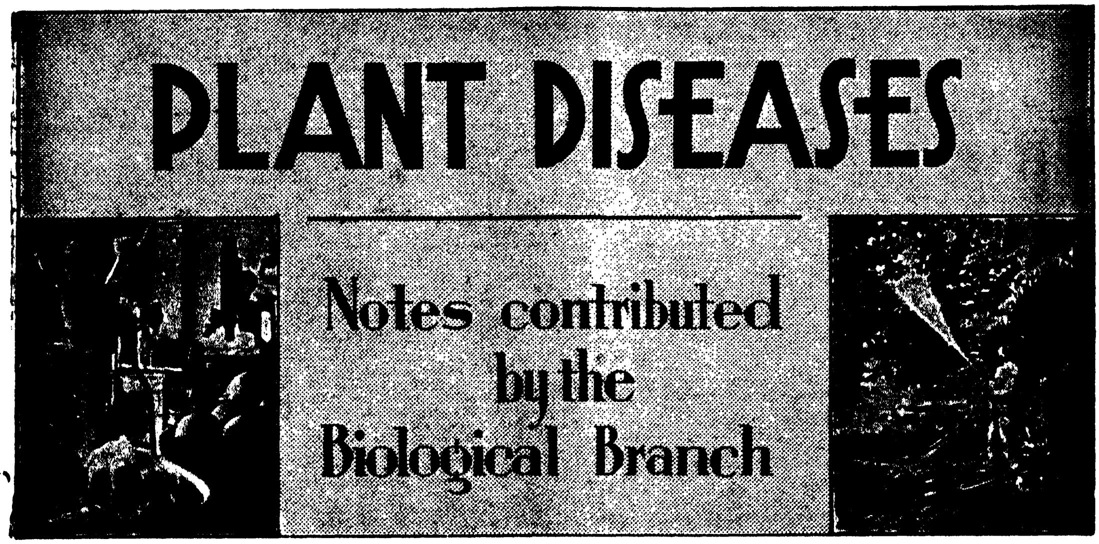
Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.



Downy Mildew (Blue Mould) of Tobacco.

DOWNY mildew of tobacco, caused by the parasitic fungus *Peronospora tabacina,* **is the most serious disease with which tobacco growers in this State have to contend. It is primarily a disease of the seed bed, where it is capable of rapidly destroying the entire seedling stand. Plants may be affected in the field if protracted cool wet weather follows transplanting. The disease commonly appears in the autumn when it may be found on the leaves, flowers and seed heads.**

This disease is also commonly known as blue mould, but this name is considered misleading for two reasons:—

(*a*) The fungal growth on diseased leaves is not always violet or blue in colour; and

(*b*) the causal organism is not a mould but a downy mildew closely related to the downy mildews causing diseases of onions, lucerne, crucifers, etc.

Sources of Infection.

The disease may develop as the result of using infected seed, planting in infested soil or through failure to destroy old tobacco plants that survive the winter. Diseased native wild tobacco plants may also serve as a source of infection.

Symptoms of the Disease.

The symptoms of disease, as well as its rate of spread throughout the bed and the severity of attack, are influenced by many factors. The most important of these are prevailing weather conditions, age and vigour of the seedlings, density of stand and seed-bed location, especially in connection with exposure, soil drainage and air circulation. The spread of the disease is particularly favoured by dull, cool, moist weather. Under such conditions patches of poorly-developed, yellowish green seedlings appear in the beds (Fig. 1). The tips of many of the upper leaves of such seedlings have a limp appearance and are frequently cupped downwards.

The most characteristic features of the disease, however, are:—

(*a*) The presence of a dense, downy coating on the lower leaf surface (Fig. 2). Under continued cool, overcast conditions this downy coating may also appear on the upper leaf surfaces. Although usually bluish or violet in colour, it is sometimes almost colourless.

(*b*) The occurrence of yellow patches on infected leaves. Should clear, warm and windy conditions intervene, the yellow patches are replaced by large, dry, brown, irregular areas (Fig. 3) which give the plants a scalded appearance.

However, if dry, warm conditions prevail from seeding time and the plants are

hardened, the disease may show as brown specks within large yellow spots. Under such conditions the characteristic downy coating may not be present.

Plants may also be attacked in the field. Yellow spots, larger but otherwise similar to those on seedling leaves, develop. Later, however, large decayed areas are formed. These may ultimately drop out, giving the leaves a torn and ragged appearance (Fig. 4).

Ordinarily with the advent of dry, warm weather, downy mildew disappears.

Control Measures.

1. Destroy all crop remains after the leaf has been harvested and eradicate volunteer plants and native wild tobacco plants in the vicinity of the seed beds. It is compulsory to destroy, by uprooting and burning, all tobacco plants by not later than the 30th June each year.

There is ample evidence to show that where plant refuse from previous crops is destroyed and volunteer plants are eradicated, disease control is aided considerably.

Fig. 1.—Tobacco Seedlings.
A.—Affected with downy mildew. Note loss of leaf colour and limp appearance of plants.
B.—Normal, disease-free seedlings.
[*After Clayton and Gaines.*

2. Select a suitable seed-bed site, avoiding areas in which infection has occurred previously. The site should be well drained and exposed to sunlight. Low-lying, shaded areas should be avoided.

3. Use disease-free seed only. Seed obtained from plants affected with downy mildew should never be retained for seed purposes.

4. Use fertile soil in the seed bed. This favours rapid and vigorous seedling growth.

Fig. 2.—Under Surface of Portion of Young Tobacco Leaf showing Dense, Downy Coating of Fungal Growth.

Prior to seeding, it is also advisable to sterilise seed-bed soil by steaming or by saturating the soil with formalin (1 gallon of formalin to 50 gallons of water). Full details of these treatments are to be found in Plant Disease Leaflet No. 103, obtainable, on request, from the Department of Agriculture (Box 36A, G.P.O., Sydney).

5. Do not sow too thickly initially, and, later, if necessary, thin out to avoid overcrowding in the beds. Seedlings should be "hardened off" gradually by exposure to air and sunlight.

6. Destroy mildewed plants in the beds as soon as they are observed.

7. Seedlings should be subjected to treatment with benzol fumes shortly after emergence, and fumigation should continue each night until the seedlings are ready for transplanting. In using benzol it should be noted, firstly, that it is highly inflammable, and, secondly, that it will kill any plants on which it is spilt.

Details of the Benzol Treatment.

The principle of the treatment consists of exposure of the seedlings to the vapours which arise from benzol.

In order to obtain an even distribution of fumes, benzol is placed in a series of tins which are evenly spaced throughout the seed bed. The tins should be approximately 1½ inches deep and should be filled with benzol to a depth of 1 to 1¼ inches. It is necessary that the aggregate surface area of the liquid be approximately 1/100th of the area of the seed bed.

A common seed-bed frame measures 25 feet long by 4 feet wide, with the walls 9 inches to 1 foot higher at the back than the front, which should be some 5 to 6 inches above soil level. Thus the surface area of benzol required for a standard seed-bed frame measuring 25 feet by 4 feet would be 1 square foot.

A table showing the number of tins of various diameters which would be required to provide the necessary surface area of benzol for a seed bed of this size is given below.

Diameter of Tin.	No. of Tins Required.
3 inches	20
4 „	11
5 „	7
6 „	5
7 „	4

The tins, placed on supports a few inches above the level of the beds, are evenly spaced each evening among the seedlings,

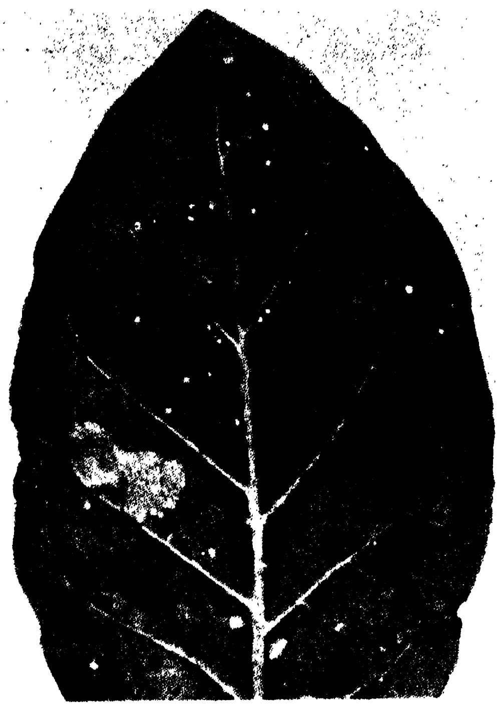


Fig. 3.—Dry, Brown, Irregular Lesions caused by Downy Mildew Infection of Older Leaf under Dry, Warm Conditions.

[*North Carolina A.E.S. Circ.* 229.

and removed each morning. Care should be taken to avoid spilling any benzol.

To retain the vapours the beds are covered each night with unbleached calico covers previously treated, preferably by painting, with boiled linseed oil and then with Shirlan A.G. to prevent deterioration by mould action.

Fig. 4.—Symptoms of Downy Mildew on Mature Leaf of Field-grown Plant.
Note torn, ragged appearance of leaf caused by dropping out of diseased tissue.

Spotted Wilt of Tomatoes.

THE Department of Agriculture recognises spotted wilt of tomatoes as the most serious disease of one of the most important vegetable crops of New South Wales.

In some localities in the vicinity of thickly-populated areas, commercial growers find it practically impossible to produce a profitable crop under outdoor conditions in spring months. Crops grown from seeds sown in December usually escape serious infection and return satisfactory yields.

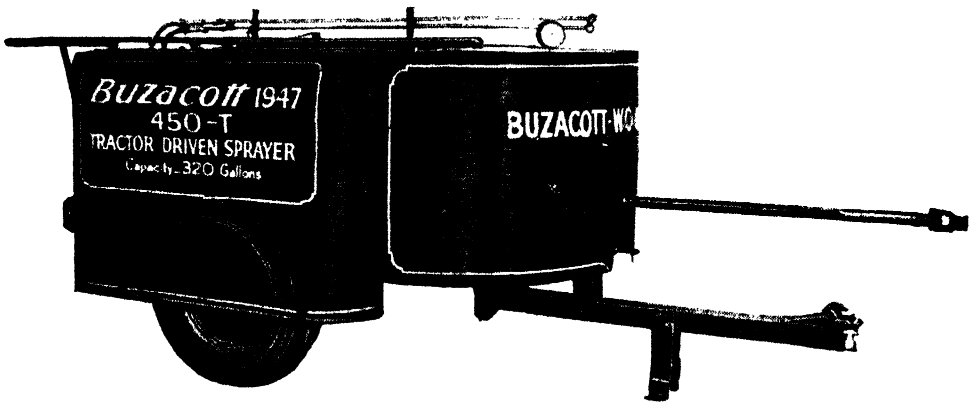
The Department has conducted experiments annually for several years in an endeavour to establish a successful method of control. So far, tartar emetic bait, compounded by mixing together 1 oz. tartar emetic, 4 oz. sugar and 4 gallons of water, has not been superseded in efficiency by any other method. This bait is effective only in those cases where the rate of infection of unsprayed plants is likely to be not greatly in excess of 50 per cent. Statistical analysis of the results obtained over a series of years indicates that the amount of spotted wilt occurring in sprayed plots is one-half that in unsprayed plots. If the infection rate is very high, the controlling effect of the spray is reduced.

Another measure which proves successful where losses of unsprayed plants are expected to be less than 70 to 80 per cent. is multiple planting. In this case two, or even three, plants are placed together at one stake, and single plants are removed as they develop the disease or as they come into competition with the plant alongside them. This method should be used in conjunction with the tartar emetic spray.

Experimental work is continuing this year as a co-operative project between the Biological Branch, Entomological Branch and the Hawkesbury Agricultural College. Four farmers in the area adjacent to Liverpool are also conducting experiments under the guidance of the Department.

COMMERCIAL growers, and home gardeners who may have only a single fruit tree, are reminded that measures for the control of fruit flies are compulsory under the Plant Diseases Act. The compulsory measures include the use of foliage poison baits and the regular destruction of any infested or fallen fruit.

POST WAR SPRAYING



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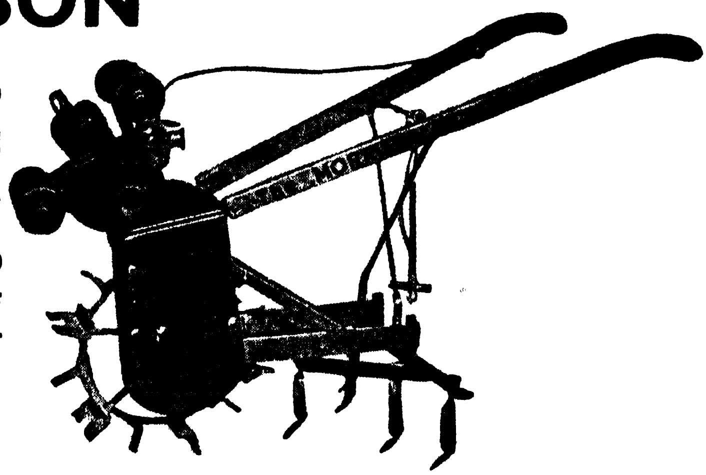


PRODUCTION OF FIELD BEANS

In New England.

A Profitable Leguminous Rotation Crop.

J. B. NOONAN, H.D.A., District Agronomist.

FIELD beans, also known as dried shell beans, are grown in many countries of the world for the production of the dried seed which is used extensively for canning such products as pork and beans, beans and tomato sauce, etc. In United States of America about two million acres of these beans are grown annually, and other areas of extensive production are found in Japan, Hungary, Rumania and Canada. Prior to World War 2, Australia imported about 2,000 tons annually, but with the outbreak of hostilities, every attempt was made to produce our own requirements.

In the last ten years the Australian consumption of field beans has risen considerably, and it is estimated that it would now take approximately 3,000 tons to satisfy normal requirements. While production of the crop has been fairly extensive over the past five years in Australia, probably not more than 1,500 tons of dry beans have been produced in the best crop year. It is obvious, therefore, that a ready market exists for considerably increased production of this crop. This is particularly so at present, also, because imports are for various reasons almost impossible.

In New South Wales the New England (or Northern Tableland) districts have been found to be the best fitted for growth of field beans, and the industry has developed considerably over the past five years. It is confidently expected that, with a considerable and very necessary improvement in the general farming methods employed in the production of field beans, the industry will develop still further and the crop will play a vital part in the rural economy of New England.

It is important to retain this industry in New England if at all possible. It is expected that this is also true of the producing districts of other Australian States. The greatest danger to the industry would appear to be importations of beans into Australia. As indicated earlier, with present Australian production, some imports are necessary to supply the balance of our requirements. It is suggested, therefore, that if Australian growers desire to develop the growing of field beans to a sound and stable

An Excellent Crop of Little Navy Field Beans.

industry, it is of paramount importance that every effort be made to satisfy the internal market with locally-grown seed. Failure to do so will certainly tend towards instability in the production of this valuable crop.

This leguminous plant fits very well into the farm rotations of New England—with maize, oats, potatoes, vegetables—and its value as a means of maintaining soil fertility is inestimable. With its relatively quick maturity, it is sown after, and harvested before, the maize crop, and by virtue of this fact it enables greater use of machinery and fuller utilisation of labour on the farm. By its growth, another crop is added to the farm programme, and the straw and waste seed (screenings, etc.) are valuable as a fodder for stock.

The yields obtained in New England have varied enormously. Too frequently they have been very low because of the beans having been treated as a "catch" crop, produced by very poor farming methods. However, experience with sound cultivation methods has indicated that an average yield of 10 bushels per acre over a number of seasons can be expected where satisfactory farming methods are followed. This expected yield, with an average price of 25s. per bushel, gives a gross return for the beans which is comparable with that of other New England crops. With the use of good harvesting methods, therefore, the nett returns are very satisfactory. It is clear that there is a very definite place for field beans on all farms with suitable soils.

Climatic Requirements.

The optimum climatic conditions for the growth of field beans may be summarised as:—

1. A frost-free period of about 120 days.
2. A relatively cool growing season with an ample and well-distributed rainfall—about 17 inches November to March inclusive.
3. A dry harvesting period.

These ideal conditions do not exist anywhere in New South Wales, but the districts with climates most closely approximating them are found in New England.

Suitable Soils and Preparation.

On the Northern Tableland, granitic soils and the red loams have been found to be most suitable, but any well-drained soil with a reasonable clay content is satisfactory for the growing of field beans. The heavy basaltic (mainly black) soils are generally unsuitable because of the rank growth predisposing the crop to staining in any but dry seasons, but nevertheless many very successful crops have been grown on them.

Successful field bean production depends on mechanisation of the harvesting, and hence scattered stone is objectionable. Much of the land used for growth of this crop is stony, and wear and tear of machinery on such areas is increased. In particular, stones damage the drums during threshing, frequently resulting in incomplete threshing; the loss of seed may be quite substantial.

Field beans do best where the soil is well prepared, and generally this fact has not been given the attention it deserves. Too often preparation of land for beans has only been considered when maize sowing has been completed—*i.e.*, just before the normal seeding time for the crop—and this has frequently resulted in bean crops being overrun with heavy weed growth later.

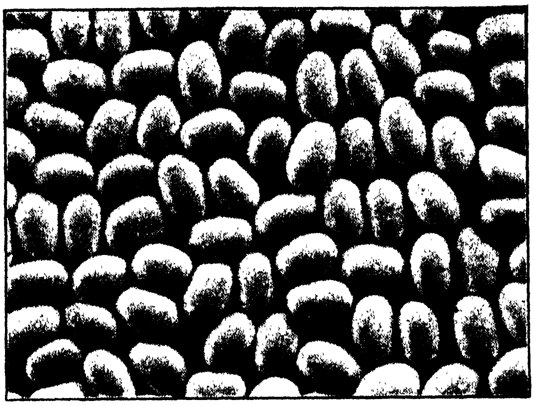
Good soil preparation demands an early initial working, and ploughing should be got under way as early as possible—say midwinter. The subsequent working of the land will depend on the soil, but certainly on old land every attempt must be made to get as many germinations of weed seeds as possible. This means breaking the sod down about late August, and harrows, a tandem disc, or scarifiers may be used. As soon as the weed germination is evident, the area should be harrowed well, but it is unwise to work the land deeply, as with dry springs the soil might dry out so that no further germinations of weeds are obtained.

The ultimate aim is to have a fairly fine and firm seed-bed ready for sowing in November. Where these operations have been followed, and the season normal, rolling will not be necessary. In wet springs, weeds might get out of hand, and a deep working be necessary, but otherwise this should be avoided late in the season.

Sowing.

In New England, with the Little Navy variety, the most suitable time for general seeding is mid-November. By that time, the danger of damaging frosts is past, and the soil has warmed up somewhat. Crops sown

at that time will be favoured by the normal January and February rains, and will mature in late March ready for the usually drier April for harvesting. Beans sown earlier than mid-November are likely to flower during the hotter weather, and, due to the faulty setting, make second growth. Under these conditions there is always a great danger of the earlier beans moulding, while later settings mature. In the higher



Good Sample of Little Navy Field Bean.
Note uniformity of colour and shape.
(About natural size.)

parts of New England (Guyra-Ben Lomond) the seeding should be finished by the end of November, and in the rest of the district, by mid-December.

Michelite might be sown a week later than Little Navy, and Pinto and Great Northern a week to ten days after the Michelite.

The combine is excellent for sowing beans, and the two-row maize planter is also very satisfactory. To check the drying out of the soil after the combine, the land should be harrowed immediately, and the trailing harrows should be attached behind the drill. For light soils, the row spacing should be 28 to 30 inches, but on heavier land should be widened to 36 inches to allow of bigger vine growth. The seeds are spaced 2 to 3 inches apart in the rows, and sown at a depth of 1½ to 2 inches, the deeper seeding for light soils. The seeding rate recommended is 25 to 30 lb. for Little Navy, 30 lb. for Michelite, and 40 to 45 lb. for Pinto and Great Northern.

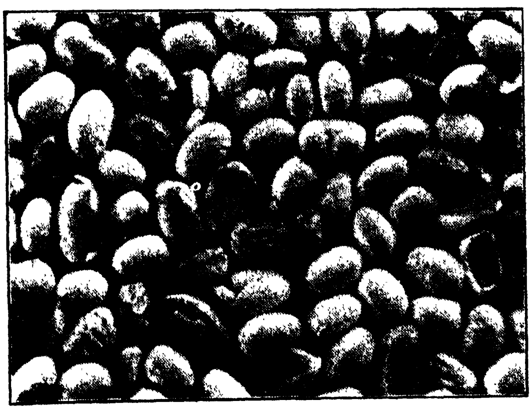
Fertilizer.

On most soils ½ to 1 cwt. of superphosphate should be used per acre, the higher rate for the granitic soils. Modern maize planters place the fertiliser correctly, but with combines it is advisable to apply the fertiliser through the two adjacent runs to that sowing the seed, and not with the seed itself. If possible, the fertiliser should be placed about 2 inches from the seed, and thus it will be necessary to move the feet sowing the fertiliser closer to the seed run.

Cultivation of the Crop.

It is advisable to give the area a harrowing two to three days after sowing, but only a light implement should be used. This will destroy weed seedlings. A further harrowing is advised as soon as the plants are well established, and this working is probably the most important one because it should kill the weeds along the row itself. Inter-row cultivations are given as indicated by weed development, and once the plants are well grown the depth should be decreased greatly to avoid root injury.

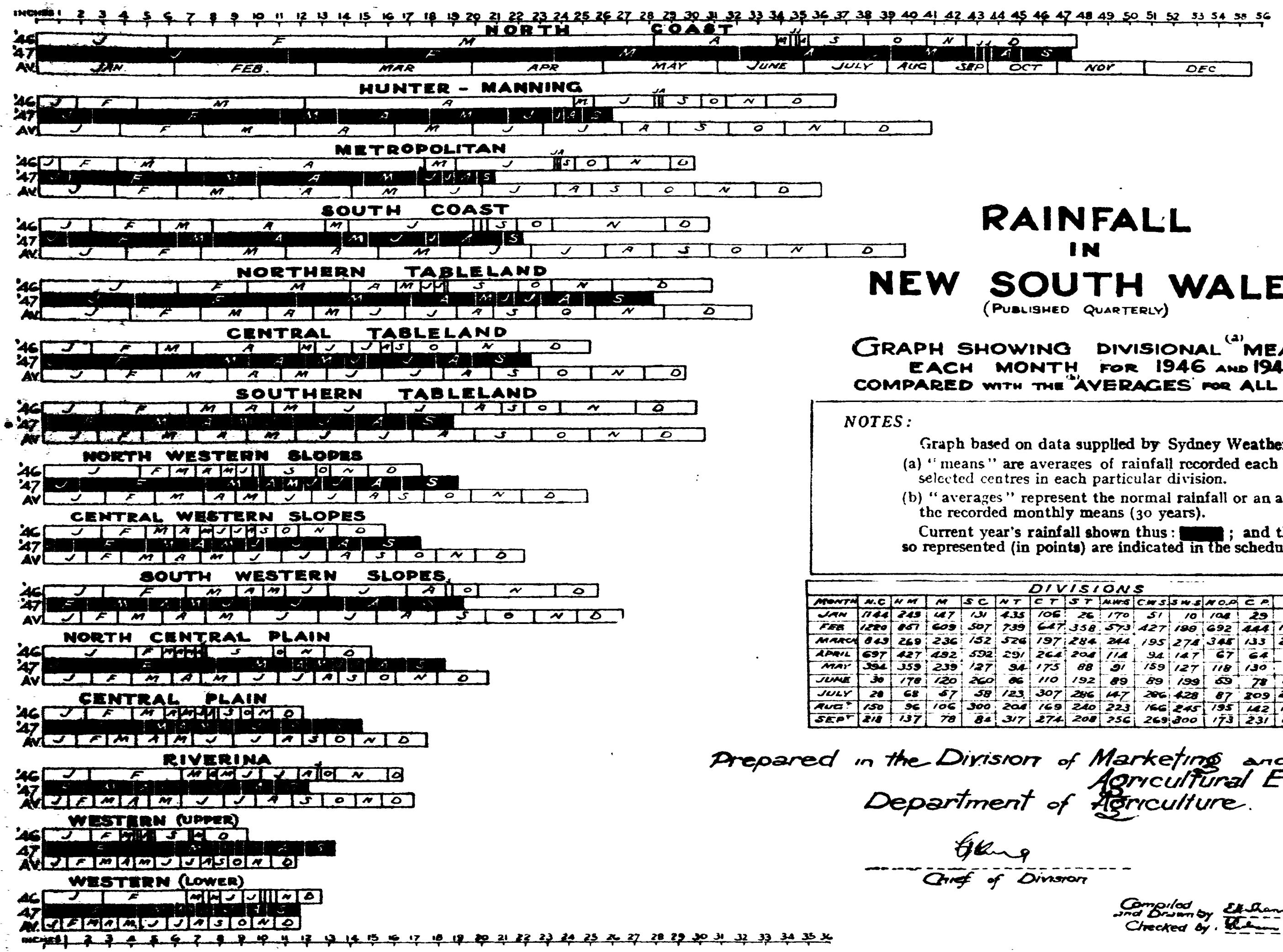
On new areas a few weeds will always escape—fat hen, etc.—and in order to keep the ground clean for subsequent crops, it is wise to go through the crop and kill these before they seed. On old land, weed control is largely determined by the kills obtained prior to sowing, and in normal years the crop cultivation suggested above will keep the



Inferior Sample.
Totally unsuitable for canning or seed purposes.

beans free of serious weed growth. However, in wet summers, heavy weed growth frequently occurs after cultivation is completed, and little can be done about it. Cereal crops in rotation with beans will assist in cleaning up these old paddocks.

(To be continued.)



RAINFALL IN NEW SOUTH WALES

(PUBLISHED QUARTERLY)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1946 AND 1947 COMPARED WITH THE (b) AVERAGES FOR ALL YEARS.

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "averages" represent the normal rainfall or an average of the recorded monthly means (30 years).

Current year's rainfall shown thus: ; and the figures so represented (in points) are indicated in the schedule below:

	DIVISIONS														
MONTH	N.C	H M	M	S C	N T	C T	S T	N.W.S	C W S	S W S	N C.P	C P.	R	W U	W L.
JAN	1144	245	147	131	435	106	26	170	51	10	108	29	11	12	6
FEB	1220	851	609	507	739	647	358	573	427	188	692	444	174	592	423
MARCH	843	269	236	152	526	197	284	244	195	274	345	133	230	174	164
APRIL	697	427	492	592	291	264	208	114	94	147	67	64	96	25	63
MAY	394	359	239	127	94	175	88	91	159	127	118	130	36	70	33
JUNE	30	178	120	260	86	110	192	89	89	199	69	78	118	37	83
JULY	28	68	57	58	123	307	286	147	286	428	87	209	244	99	154
AUGT	150	96	106	300	204	169	240	223	166	245	195	142	146	185	88
SEPT	218	137	78	84	317	274	208	256	269	300	173	231	161	139	151

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

Chief of Division

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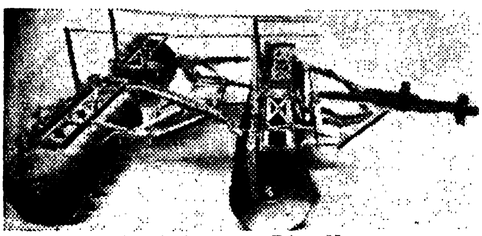
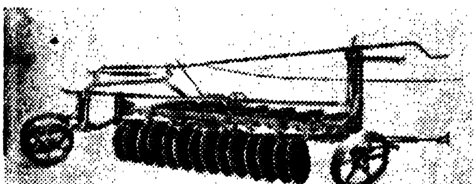
Checked by

GL186-24

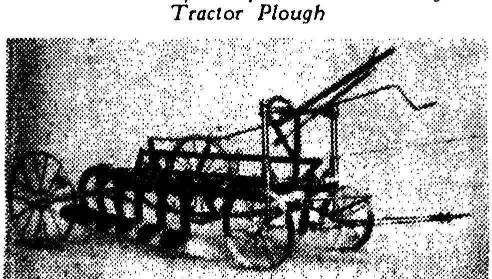
McCormick-Deering Model W-6 Tractor



GL-9A Tractor Disc Harrow



GL-90 Stump-Jump Disc Cultivating Tractor Plough



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HAYMAKING

A Means of Conserving Fodder

That is Palatable and Nutritious.

(*Continued from page 534.*)

●

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

PREVIOUS instalments of this article (which commenced in July issue) have dealt with the place of hay in fodder conservation programmes and with the methods of cutting, curing and stacking cereal hay.

This month the making of lucerne and pasture hays is described.

LUCERNE HAYMAKING.

Of the crops generally grown for hay, lucerne is the most difficult to cure, and the one most subject to damage and loss through incorrect handling in all stages from cutting to baling. To command the highest price on the market, or for best quality for home use, it should contain a high percentage of leaf (40 to 50 per cent.), and be free from impurities such as stubble or weeds (particularly dodder) which may be spread by use of infested hay. A good green colour and plenty of leaf indicate soundness and high nutritive value maintained by careful handling and cutting at the right stage of growth. A minimum of dust is desirable, and shattering through rough handling and over-drying tends to cause this undesirable condition. Mouldiness is a bad feature. Hay that is heated slightly is quite attractive to stock, but the digestibility is impaired. The slightest indication of heating in the bale will cause buyers to reject a sample completely or buy only at greatly reduced prices.

When to Cut.

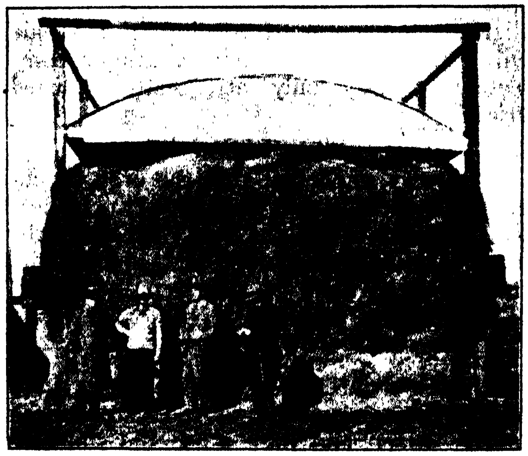
It is very important that the crop be cut at the correct stage of maturity. If left too long, much of the leaf, which is the most valuable part of the plant, is lost from the lower portions of the stems. Digestibility is lower and the weight of hay produced is reduced by leaf loss.

Although cutting too early results in a loss in the total weight of fodder produced in the season and may cause the stand to "run out" quickly, the greatest danger lies in cutting too late, and it is in this direction that most growers err. If the average

A Pick-up Loader and Power Baler at Work in a Pasture of Clover and Barley Grass.

time for a cut of lucerne be taken as six weeks, making five cuts in a season of thirty weeks, and if cutting is delayed until the seventh week of each occasion, then only four cuts are obtained, which means an annual loss of 15 cwt. to 1 ton of hay per acre, and more under irrigation. The only excuse for cutting late is the advent of wet weather conditions unsuitable for curing.

Lucerne should be cut when about one tenth to one fifth of the crop is in flower. The first crop of the season may not flower, and in all cases, the crop should be cut when the second growth appears from the crown of the plant, and the lower leaves begin to lose colour. Cutting however,



Movable Roof on Haystack.

should not be delayed until the new growth has grown so long that it is cut by the mower, as in this case the new growth dies back and the crowns have to shoot away again, increasing the time to the next cut.

Cutting is done with the mower or scythe; most commonly the ordinary horse mower is used when there is the prospect of fine weather persisting long enough to permit curing. Cutting should commence as early as possible in the morning after the dew has left the plants and the crop may be allowed to wilt in the swath for a short period, something like two to three hours on a mild day. In light crops the rake should follow close after the mower if the weather is warm; the object is to have the crop raked into the windrows before the leaves dry leaving the stems still sappy. If this occurs much leaf will be lost during raking and cocking and handling operations. Cocking should also be carried out with a view to avoiding drying and shattering of the leaf. In mid-summer, with average crops, the early morning cuts may be in the cock before mid-day.

Cocking.

The cocks should be built in layers from the windrow using a pitch fork, successive forkfuls being placed one above the other to build a cock about 2 feet 6 inches in diameter and about 3 feet high. On no account "roll up" the windrows to form cocks, as the wind will blow them down readily and such material is impossible to handle on the lorry. Small, tall cocks like those recommended allow free circulation of air and shed rain better. Maximum shading is also given, only a limited amount of the material on the outside being reached by the sun. Cocks should be stable against reasonable winds, but not compacted, thus allowing air circulation within them.

In scorching hot weather the time in the windrow should be short and the hay should be cocked almost immediately to prevent bleaching and shattering of the leaves, but in dull cloudy weather up to two days may be needed for wilting. The hay dries best when the leaves are losing water naturally, which gradually withdraws moisture from the stems. Too-rapid drying in the windrow tends to "case harden" the stems and dry the leaves too quickly. The best product is obtained by wilting in the cock when most of the leaves are protected from the sun. It is not advisable to cock when the material has been wet by rain.

The ordinary dump rake is usually employed to make windrows, although side delivery rakes prepare a better windrow. The hay dries quickest in the windrows but they are made chiefly to facilitate cocking. The greater part of the curing of the hay takes place in the cock and finally in the stack. In wet muggy weather, mould is liable to form in the cocks, especially where leafy, sappy material is handled. This danger can be obviated by turning the cocks to let in the air. Just before carrying to the stack, the cocks are sometimes turned over to expose the lower hay which might be slightly damp; an hour or two in the sun dries off the moisture and leaves the hay in proper condition for stacking.

The Rake at Work in a Heavy Crop of Paspalum Hay.

The time the hay is allowed to remain in the cocks depends upon the weather conditions. In fine, hot weather the hay can be stacked in one or two days after cutting, while in cool weather three to four days may be necessary. Care must be taken that the material is not stacked whilst so damp that combustion or mould will occur in the stack, but the ill effects of over-drying should also be remembered. It is a work in which some experience is required to secure the best results. A farmer with a large quantity of valuable hay lying in the field is tempted to bring it in too early to avoid the risk of damage from rain, while in good drying weather he is inclined to leave it longer than necessary to avoid the risk of loss in the stack. It must be remembered that good colour is of great importance and that by leaving the material too long, the hay on the outside of the cocks will bleach, and lose its green colour, seriously affecting the appearance of the whole of the hay.

Generally speaking good drying weather can be obtained in most of the lucerne-growing districts of the State, and the chief danger to provide against is over-drying.

Stacking.

It is almost impossible to indicate exactly when the hay is at the right stage for stacking. Little danger exists in insufficient drying of the leaves, the chief danger being in the stems. These should be examined carefully to ascertain whether they have lost their sappiness. If they are sappy and moist the hay should not be stacked. Generally the material is right to bring in when it has a crisp, rather than a damp feeling. Further tests for the suitability of hay for stacking include twisting a small bundle from the centre of the cock in the hands when it may be regarded as ready for stacking if no moisture exudes. The skin of the stalks of hay ready for stacking is difficult to scratch off with the thumb nail.

Lucerne hay should preferably be stored in sheds, as it does not shed rain while in the open. Storing in sheds, besides being more convenient, has the advantage that when baling or feeding, no damage can be done to the hay by rain or heat.

Before building, a foundation of poles should be laid down to give ventilation to the bottom of the stack; if stacked on the ground some of the hay is sure to spoil. In building a stack in the open the centre should be kept high so that the rain will not run in from the sides. Stacks built in the open should be fairly large, containing if possible at least 20 tons of hay which should be well tramped during stacking.

Carting In.

The hay is usually carted in from the field in waggons. One man stands on the load to tramp down the centre and direct and assist in the placing of cocks by the loaders on the ground. It is better to have the waggon drawn by horses which re-

spond to spoken commands, because, if a tractor is used, the labour of one man is needed almost full time to drive the tractor. The most effective method of using a tractor when more than one waggon is in use, is to draw the lorries in the field with a horse team, and cart from the fields to the stack by means of the more rapid tractor. The labour of the tractor driver is available for unloading.

In loading a lorry a large cock is first placed at each of the corners and the load then built up shinglewise along the four sides, each cock overlapping the preceding one and the final cock tying the rest together in the centre. After two layers have been built up in this fashion from the corners, cocks may be thrown into the middle which is kept slightly lower than the side until the final few cocks are put on. With a little practice it is easy to unload again by lifting up the original cocks unbroken. By merely plunging the fork into the load haphazardly much energy is lost and time wasted.

On coastal dairy farms where individual paddocks are small so that the amount of hay handled at a time is limited, the hay can, if necessary, be brought in early and spread about in a thin layer, say up to 1 foot deep, over the hay already present in a large shed. This permits of carting in a little greener and avoids leaving hay out overnight to become wet by dew. Provided the layer of hay is not more than 9 inches or 1 foot deep, heating will not occur. If necessary, the newly-placed hay can be turned in the morning to allow ventilation and cooling. If this practice is followed, stack loosely.

The curing of lucerne hay continues for some time in the stack, the hay mellowing and maturing completely.

Baling and Marketing.

Baling is often carried out from the stack, or, sometimes, direct from the field, the hay maturing in the bale. This latter practice affords a considerable saving in time and labour cost, almost equal to the time and labour expended in stacking. In baling from the field, care must be taken that the hay is quite dry before it is put into tightly compressed bales, otherwise rapid heating may occur. A small-sized bale is generally preferred. Any bunches of weeds or spoiled hay which are noticed during baling should be discarded so that the bales contain only good quality hay which commands the highest market price.

By baling from the stack in the early morning or in the cool of the evening it is possible to preserve the leafiness of the loose hay. The bales should be neatly made and firmly wired.

Brown Lucerne Hay.

Many dairy farmers claim that brown lucerne hay has several advantages over dry, green hay; it is said to be more succulent, freer from dust and generally more relished by cows. On the other hand a little more experience is necessary to turn out with certainty good brown hay, although it can be produced successfully at periods of the year and in weather that would preclude the making of green lucerne hay.

The methods of cutting and curing are the same as outlined for the making of green lucerne hay, except that the hay is not allowed to become so dry in the field. With this increased amount of moisture in the stack, risk of overheating and spontaneous combustion is, of course, greater, and experience alone will tell at what stage to stack so as to avoid this danger. The risk of firing is probably the reason why brown hay is not more extensively made.

Under conditions when the making of dry lucerne hay is made difficult by the presence of excessive moisture either as dew or rain, or when the lucerne crop contains winter grasses such as barley grass and weeds, the harshness of which reduces the value of the hay, it is preferable to stack the crop when sufficiently moist to cause some heating and fermentation, thus resulting in the production of brown lucerne hay.

Brown lucerne hay differs from silage in the amount of moisture present in the material when it is stacked. If the crop is mown before the bottom leaves fall or when only a small percentage of the plants are in flower, and the material stacked immediately it will consolidate and form "fruity" green or pale brown silage, but by allowing the moisture to dry out until the material is only just pliable and soft (about three parts dry) before stacking, the individual plants will remain separate although consolidating more than dry hay, and sufficient moisture

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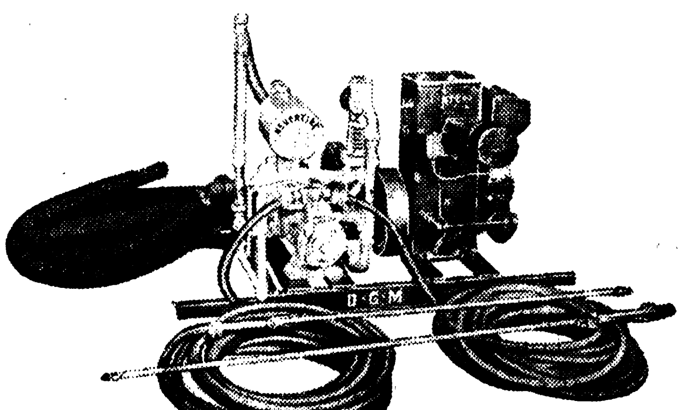

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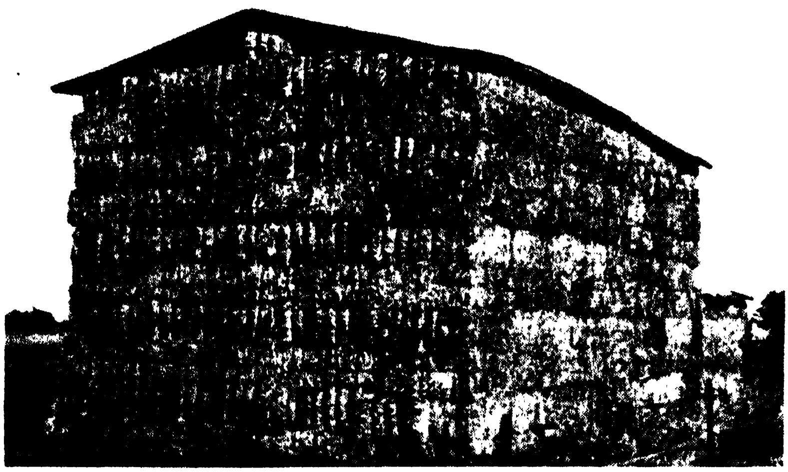
may be present to complete the curing as dry brown hay.

If the farmer is inexperienced he may prefer to avoid the risk attached to the making of brown hay and prepare silage when circumstances are unfavourable to green hay production.

Although brown lucerne hay is most palatable to stock, and they eat it readily, it is probable that the heating which occurs affects the digestibility of the material to some extent. This may be counteracted to some extent by a decrease in the losses during field curing of green lucerne hay, as material from which brown lucerne hay is to be made is not left in the field as long, or under as dry conditions. During the curing of hay, even under ideal conditions, up to 30 per cent. and occasionally more of the foodstuff present in the original green crop is lost, due mainly to the fact that the plant, although cut, is not killed and continues using up its food reserves to maintain its life processes.



Baled Cereal Hay.
The iron roof supported by the single top layer of bales, is wired to the base of the stack.

MEADOW HAYMAKING.

During recent years the practice of making pasture hays has become much more popular, and there is considerable scope for further increase in this branch of haymaking as an adjunct to sound pasture management and for the storing of surplus growth in good seasons. In every district the production of pastures exceeds the needs of the stock grazed on them at certain periods or in certain years. In districts such as the north-west and the Far North Coast the increased pasturage through the flush period would maintain the stock for many months.

Pasture Hays are Cheaply Conserved.

Pasture hays are conserved cheaply, and there are no cultivation costs to be met, while at the same time, the quality of the grassland is improved by judicious mowing. At the very most the cost of home-grown feed does not exceed half the purchase price of feed brought to the farm. The cost of fodder landed on the farm is never less than £4 per ton, and in drought periods may rise to £9 or £10 per ton.

Whatever the system of feeding, fodder roughages are always the most expensive food stuffs to buy per unit of food value, and the dairy farmer in particular should always endeavour to grow his own roughages. If foodstuff has to be bought, endeavour to buy only concentrates in the form of the cheaper cereal grains such as wheat, barley and oats, and various protein meals. A fair estimate of the cost of producing stacked or baled meadow hay would be £2 to £2 10s. per ton under reasonable working conditions.

In coastal districts grass hay can be made in any area where lucerne hay is successfully cured. The principles of pasture haymaking generally, are the same as those for lucerne hay production.

Early Cutting May Prejudice Seeding.

The trouble with most pasture hay in the past has been that, generally speaking, all samples offered have been cut far too late. This probably accounts for the prejudice of many Metropolitan buyers against it. With temporary pastures, however, there is a danger that if the first crop is cut early the aftermath may be caught by hot dry weather and fail to set seed. Under these conditions particularly on irrigation areas it may be advisable to cut Wimmera rye grass for hay when it commences to mature seed. Sufficient of the ripening seed will fall to ensure reseeding for the following year. Usually no trouble is experienced with Subterranean clover in respect of reseeding, as this plant will have set some seed by mowing time and the stubble will retain sufficient seed heads to ensure reseeding. The cost of Wimmera rye grass seed is small in comparison with the value of the hay cut, and the additional value of the early cut hay would probably compensate for the additional cost of a light seeding when applying the annual fertiliser dressing in autumn, if it appears that sufficient natural seed has not fallen.

Wimmera rye grass retains its colour very well when cut and there is an absence of discoloured flag on the sample of hay produced. Even when there is seed present in the hay, rats and mice are not attracted to the same extent as to cereals, because of the smaller grain.

The Presence of Clover is very Desirable.

The presence of clover growth is very desirable in a sward cut for hay, and greatly enhances the value of the product. Thick stands of Subterranean clover in the Eastern Riverina and southern tableland require quite a special technique for cutting. A high speed mower knife is used, certain makes of mower being fitted with a special two-speed gear box for standard and high speed cutting. In a thick stand a "swath parter" may be necessary, a scythe blade attached at right angles to the end of the mower knife sloping backwards being often recommended. However, such a scythe blade requires constant attention to keep it in condition.

In the north-west considerable areas of Mitchell grass have been cut for hay successfully in the past, and provided it is cut green while the seed is immature or just as the seed heads appear, this grass has excellent feeding qualities.

Paspalum Hay.

When cut at the correct stage of growth, and particularly if a proportion of clover growth is present, the feeding value of conserved paspalum hay is high. Paspalum paddocks that are free of stones and have been renovated and harrowed during the autumn and winter months to open up the surface soil and to collect any dead grass and other surface plant trash, will be in a suitable condition for the mowing machine to operate satisfactorily.

The removal of surface grass growth leaves the paddock in a better condition to produce the class of pasturage required by cows in high production, viz.; succulent young grass containing clover growth. Clovers do not thrive in a dense, over-mature paspalum sward.

Usually the pasturage is cut and allowed to wilt for two or three days, then raked into windrows for further drying. In heavy cuts it will be necessary to turn the windrows with the hay-rake so as to expose any green or partially-dried material to the sun. The hay is either cocked and later loaded on to lorries, or sweep-raked direct from the windrows to the stack or hay-baler.

Upwards of 2 tons of paspalum-white clover hay per acre may be cut at the early flowering stage from top-dressed pastures in early summer. Many thousands of tons of ready made "crop" are wasted in coastal districts in average to good seasons because this surplus feed is not harvested.

Paspalum makes hay of excellent quality provided the area has been regularly renovated, harrowed and top-dressed; the grass is cut just as the seed heads appear; a proportion of legume is present in the material harvested; and the weather during haymaking is satisfactory.

There is a danger of ergot being present on paspalum seed heads and causing digestive trouble in stock. This may be avoided by cutting early when the ergot, even on the earlier-formed heads, will be only in the honey-dew stage. However, if the ergot has reached the "ball" stage on mature pasture the hay may prove injurious if fed in

(*Continued on page* 599.)

The Way to—

BETTER PASTURES IN THE CENTRAL WEST.

(*Concluded from page 523.*)

B. D. AMENT, H.D.A., Agrostologist.

THIS article commenced in July issue. In previous instalments the author has discussed the influence of the improvement of pastures in this area on soil fertility, soil erosion, carrying capacity and weed control, and has indicated the methods of improvement suitable for natural pastures as well as permanent and temporary sown pastures.

The management of established pastures and the production of pasture seed crops are dealt with in this concluding portion.

Management of Established Pastures.

It is one thing to plant and establish pastures; it is quite another to manage them so as to produce the maximum possible return over a period of years.

The system of grazing natural pastures which has developed in Australia, consists for the most part of stocking a pasture with what is regarded as the normal complement of stock and allowing those stock to remain there as long as there is feed and water for them, or they do not lose condition. With large areas, such as are now found in the western half of the State, this system, or a slight modification of it, is the only one practicable.

In the eastern and central portions of this State, this system is wasteful; it does not allow the pastures to produce the maximum in animal products, and it brings about pasture deterioration. Stock are, to a degree, selective feeders, and when continuously grazing on one area, tend to concentrate on the more palatable species and kill them out, allowing the less palatable and less valuable species to become dominant.

In contrast to this is the system practised on sown pastures on some coastal dairy farms and some irrigated sown pastures—a system of rotational grazing involving stocking a pasture very heavily and eating it right off in about three days, then spelling for a number of weeks before grazing again. Mechanically, this system is fairly close to mowing in that the heavy, quick grazing removes all top growth, and

A Seed Crop of Italian Rye Grass. Orange district.

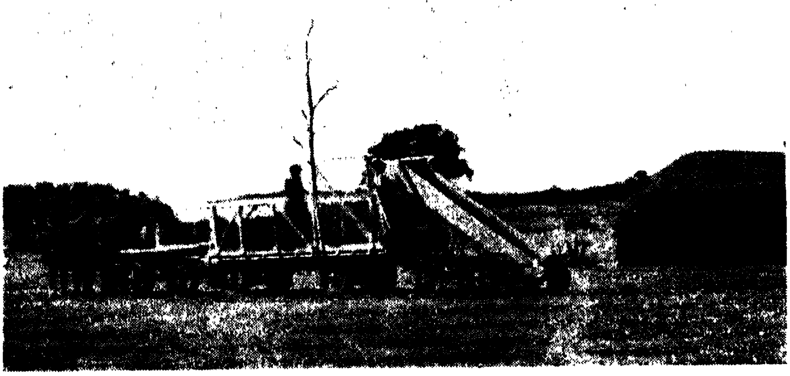
the new shoots are allowed to grow up again instead of being nipped off, but this method has the advantage over mowing that animal droppings are returned to the soil. Root growth is closely related to top growth, and plants which are continually kept eaten off short do not develop robust root systems.

Owing to the vagaries of climate (temperature and rainfall) and the variation in soils, this extreme system is not generally practicable on the Tablelands and Slopes, but a compromise system designed to obtain the maximum economic production, and at the same time maintaining the pastures in good condition is possible.

quickly as possible. It is naturally impossible to adhere to this rule, but it should be kept in mind. In many countries it is found desirable to run some cattle on sheep properties to clean up any roughage left by sheep. Fencing is often a limiting factor here, as cattle require better fences than sheep.

Topdressing.

In these areas superphosphate is the only fertiliser which can be used economically for topdressing sown pastures. The question of how much to use per acre and how it should be used depends mainly on the rainfall. On the Central Tableland 1 cwt.



A Pick-up Elevator used for Collecting Subterranean Clover Plants Carrying Seed Pods.

Stack of clover on right which will later be threshed for seed—Blayney district.

per acre annually can profitably be used. On the Central Western Slope 1 cwt. per acre every second year should be used except where irrigation is carried out, when this quantity can be increased to 1 cwt. annually. Where seed production is to be undertaken, spring and autumn applications of 1 cwt. per acre each should be used.

There has been much controversy on the question of whether or not it pays to topdress every year. During the period of short supply it was established that sown pastures could be maintained without fertiliser, but production suffered. Results have shown that regular topdressings pay.

Subdivision.

Much benefit and increased production can be derived by subdivision into comparatively small areas, and there are numerous properties on the Tablelands and nearer Slopes subdivided into twenty or even thirty or more paddocks. In subdividing, topography of the land must be considered, particularly on the Tablelands where the direction of the slope affects the growth of the pasture and the soil erosion hazard must be considered; fencing on the contour is often preferable.

The high cost of fencing and provision of additional stock watering facilities limit the extent to which subdivision can be carried out. British breeds and crossbred sheep can be run satisfactorily on small areas, but Merinos require comparatively large areas on which to graze.

Grazing.

The ideal stage at which to graze sheep pastures is when they are 3 to 4 inches high, and they should be grazed down as

Renovation.

Most sown pastures receive considerable benefit from some form of renovation, the severity and frequency of which depend upon the type of pasture, soil and the rate of stocking. Heavily grazed pastures require more frequent renovation, as the soil surface is tramped hard.

Grazing lucerne requires renovation with a rigid-tyned fine-pointed implement or one of the special renovators once a year, the best time for this work being July or August. The annual topdressing can be carried out at the same time. Except on self-mulching soils, Wimmera Rye grass usually disappears from a pasture unless renovation is carried out every two or three years.

With a mixture of grasses and clovers, such as Subterranean clover and perennial Rye, renovation every three or four years is advisable. With a pure Subterranean clover pasture, the same procedure may be adopted and Wimmera Rye grass or a cereal sown to provide extra feed.

In the case of a pasture predominantly *Phalaris tuberosa*, a more severe renovation every five or six years is desirable. Ploughing with a short mouldboard plough so that the sod is not turned right over makes the best job, followed by harrowing. This should be done in late winter.

standing is either leached of nutrients or rotten when required. Old dry feed may retard autumn growth.

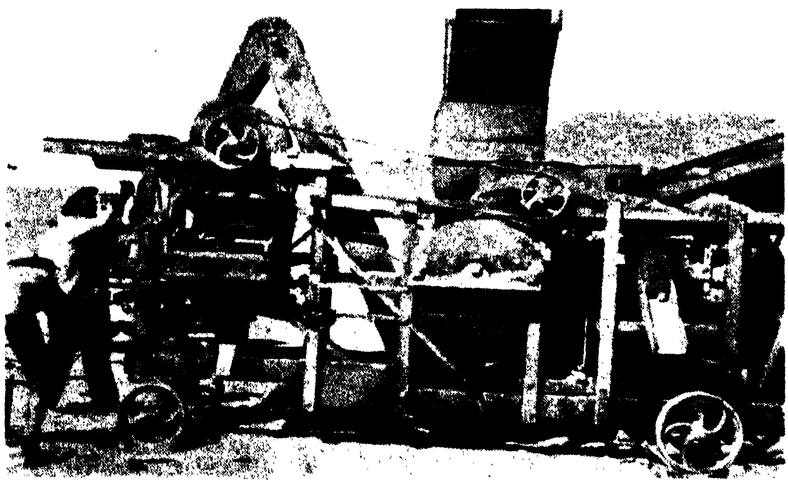
Making Meadow Hay.

Surplus pasture growth in the spring is best conserved in the form of hay to be fed when required or sold. Meadow hay is more than twice as cheap as any purchasable fodder and is cheaper than other forms of conserved fodder, as its cost is only that involved in conserving it. It is also one of the most nutritious hays.

Meadow hay has been gaining in popularity on the Central Tablelands and Slopes, and with the improvement in machinery and the advent of pick-up-balers, power mowers, side-delivery rakes, etc., there should be a big increase in its production. Stock-owners are realising its value as feed; it is relished by stock and there is little or no waste. It is rarely attacked by vermin and can be stored for a long period if well protected. Different paddocks should be cut each year in rotation.

"Kaesler" Subterranean Clover Seed Thresher.

Large stones etc. are ejected from chute on right. The drum in the centre removes seed pods from runners.



The use of grass harrows only is not very satisfactory for renovation, but is useful for spreading droppings.

Mowing.

On a grazing property, a mower is a most useful implement to control growth where this cannot be done with stock. Pastures should not, as a general rule, be allowed to become rank, and after grazing, any rank growth that remains should be mown. Surplus spring growth left

The time to cut pasture for hay is when the anthers emerge from the flowers of the main grass present, or in the case of lucerne or clover, when the stand is well out in flower.

The usual method is to cut the pasture with a mower, rake within twenty-four hours into large windrows, and as soon as cured, sweep direct to the press or stack, or bale with a pick-up baler. The difference between the cost of conserving loose

and baled hay is small and considering the convenience of having the hay in bales, the extra cost is warranted.

Seed Production.

The production for sale of seed of the various pasture species can be a very lucrative sideline to farming and grazing activities. In the past, much of this State's pasture seed requirements has been imported from other States and countries. All our requirements of most species could be produced locally.

On the Central Tablelands and Central Western Slope satisfactory payable crops of high quality seed have been produced on a commercial basis for four of the main species. On the Tableland, Government Certified Midseason Subterranean clover seed was first produced in 1939-40, and the production of this seed is now on a very sound footing and is likely to expand. The seed is of exceptionally high quality. In 1939-40 also, high quality certified seed of *Phalaris tuberosa* was produced, giving great promise for the future.

In the Central Western Slope, good crops of Wimmera Rye grass seed have been grown and for many years past large quantities of lucerne seed have been produced.

Generally speaking, however, seed has been produced from areas established primarily as pastures and seed produced only in good years. To ensure a greater continuity of production, higher and more certain yields—with greater returns for the growers—areas intended primarily for seed production should be established with grazing as the secondary consideration.

Departmental pamphlets dealing with the production of seed of the various species can be had on application to the Chief, Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Record Wheat Yield.

120,000,000 Bushels Forecast.

AN official preliminary forecast of 120,000,000 bushels, from an estimated area of 5,550,000 acres, has been released by the Minister for Agriculture, Hon. E. H. Graham, M.L.A.

That forecast (based on prospects as at 10th October) was from the most reliable information he had been able to obtain, said Mr. Graham. The record harvest would not come as a surprise to anyone who had observed the exceptionally favourable seasonal conditions.

Wheat Harvest Co-ordination Committee.

A CO-ORDINATION Committee has been set up by the N.S.W. Minister for Agriculture (Hon. E. H. Graham, M.L.A.) to advise him on the handling of the wheat harvest.

Mr. Graham stated that its purpose was to ensure that he was fully and quickly informed on developments as they took place, so that the State Government would be able to ensure that any action possible on its part could be taken in the interests of the State and the wheatgrowers.

"The Chairman of the Committee," said Mr. Graham, "is Mr. A. H. E. McDonald, an outstanding authority on wheat in this State, and it includes representatives of the Australian Wheat Board, the State Departments of Agriculture, Transport and Railways, also wheat shippers, millers, wheat handlers, wheatgrowers and the Australian Workers' Union, whose members are mainly concerned in handling the crop."

CANNING factory wastes, such as rotten fruit, vegetable tops and peel and pea vinings, are well worth carting back to the farm, points out a departmental pamphlet. They rot quickly in the soil and provide both humus and minerals. If there is any danger of introducing plant diseases, then the waste material is best composted first and subsequently incorporated with the soil.

FRUITGROWING

THE GROWING OF DATES.

J. A. BALLANTYNE, Special Fruit Officer.

FROM time to time the Department receives inquiries from persons interested in the possibility of growing dates in this State. Some of these have a few palms from which they obtain fruit of a type satisfactory for their own use, although not suitable for large-scale planting.

The purpose of this article is to set out the difficulties to be overcome before this fruit can be grown in this country and to describe the methods by which dates are produced commercially in other countries.

The successful establishment of date growing in Australia is dependent in the first place on the procuring of suitable early-maturing varieties. If it was possible to select from overseas those varieties which would be worthy of trial, the problem would be simplified. But owing to the possible introduction of the date palm scale and the fact that this scale is to be found now in all date-growing countries, including America, it is not possible to obtain offshoots which could be guaranteed to be free from this pest. Under these circumstances the importation of date varieties into Australia is now prohibited.

In 1895 some date palm offshoots were imported to this State by the Department, being supplied by the French Government from Algeria. These were planted at Pera Bore and Wollongbar. They proved unsuccessful in the latter district, whilst at Pera Bore only one of the varieties proved to be of any commercial value, and this palm did not sucker, so it was not possible to reproduce it.

The date does not reproduce true to type from seed, so that although seed could be imported, this would be useless until such times as the seedlings had been tried out in great numbers in experimental areas and suitable selections made.

It would seem that although it should be possible to grow dates commercially in Australia, until such time as it is possible to embark on a large-scale introduction of seeds and work along the lines mentioned with a view to producing varieties suited to our climatic conditions, date growing in Australia is not likely to develop to any extent.

It may be that we have within the Commonwealth some date seedlings of quality. This could only be ascertained by a survey, and any suitable varieties could be reproduced from offshoots for trials in selected areas.

The Date in Other Lands.

The date palm is one of the oldest cultivated plants; records show it to have been established in parts of the Old World even 5,000 years ago. For many hundreds of years the date has been the staple diet of

A Date Palm Plantation in U.S.A.
Note the permanently anchored platform.
[*After Albert and Hilgeman.*

the population occupying an immense area in Asia and North Africa. Countries such as Algeria, Tunis, Mesopotamia and Egypt have established an export trade which is world-wide, but generally, with the exception of North America, date growing has not been established as an industry in any other part of the world.

In the United States of America, date seedlings were grown for many years, but these were of poor quality, and it was not until the introduction of varieties from Egypt in 1899 that the industry began to develop. In subsequent years further introductions, breeding and selection of varieties and planting of experimental plots in various States and districts allowed for the ultimate establishment of date growing as an industry in California and Arizona.

Climatic Requirements.

The date palm, a sub-tropical fruit, will withstand variable climatic conditions, but is exacting in its requirements when it comes to fruit production. Humidity in the atmosphere at the ripening period may ruin the crop, as also rain during blossoming. For successful date growing heat and more heat are required—not only high temperatures during the day but also during the night. Duration of the temperature is as important as the degree of heat.

Not only does the date require heat above ground, but it requires moisture below. Once established the palm will live with little water, but for production of fruit is considered to require more than twice the amount of citrus trees.

From blossoming to maturity, even under the best conditions, the date palm will require about seven months. Some varieties are known to mature quicker and other varieties over a longer period. Our Australian climate is such that unless the earlier maturing varieties are planted they are not likely to be successful. Any reduction in temperature at the ripening period will prevent proper maturation and the crop will probably be lost. This is the main difficulty, apart from water, in New South Wales, and only the earliest maturing varieties are likely to prove successful under our conditions.

Removing Offshoots from the Parent Palm for Transplanting.
[*After Albert and Hilgeman.*

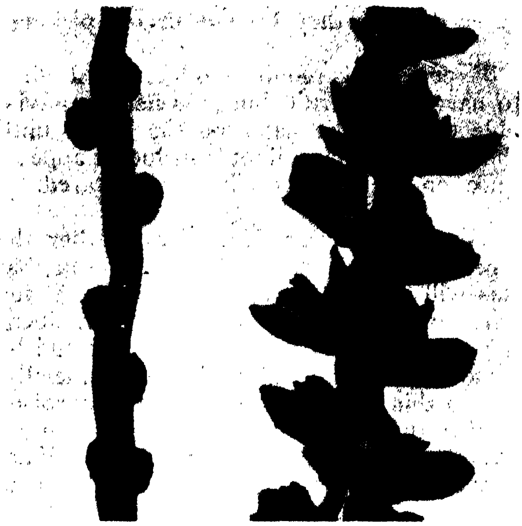
Propagation.

As previously stated the only way to perpetuate varieties satisfactorily is by means of offshoots. Offshoots are produced from buds near the base of the palm. In many cases these shoots will make root without assistance; on the other hand it may be necessary to bank earth around the base and, of course, the soil would have to be moistened and kept moist.

If the offshoot is too high on the plant for soil banking it may be necessary to build a box around the base of the plant and fill the box with well-manured soil. Offshoots should be planted out in early spring.

The planting of seedlings, as pointed out, is a gamble, as in few cases will the resultant

plant be of a desirable type. In addition there is the matter of sex. From seed the plants may develop into palms of either sex. Generally about 50 per cent. of young date seedlings prove to be male plants and not capable of cropping.



Strands of Date Flowers.
Left.—Female flowers which resemble newly developing fruits.
Right.—Male flowers, which are larger and more open.
[*After Albert and Hilgeman.*

In the early stages until it becomes established the young date requires considerable attention. It may not be possible to give this attention if the offshoots are planted in a permanent position, in which case they could be grown in a nursery. The offshoot, when detached from the parent plant, usually has poor roots and will require some nursing and care in developing it to the stage where it is fit for planting out in a permanent position and can hold its own under these more difficult conditions.

Planting.

In the Old World date palms have been planted at varying distances, and in some places average 120 palms to the acre. This number is considered excessive by all authorities and in America it is considered that they should be at least 30 to 35 feet apart or approximately thirty-five to fifty palms to the acre.

When planting the offshoot should be buried so that the portion of greatest diameter is at soil level. Following planting, the soil should be kept constantly wet by frequent irrigation, otherwise the plant will not develop the required new root growth and will not survive. When planted in permanent sites it may be advisable to afford some protection to the palm until it is established by erection of a hessian fence around each plant.

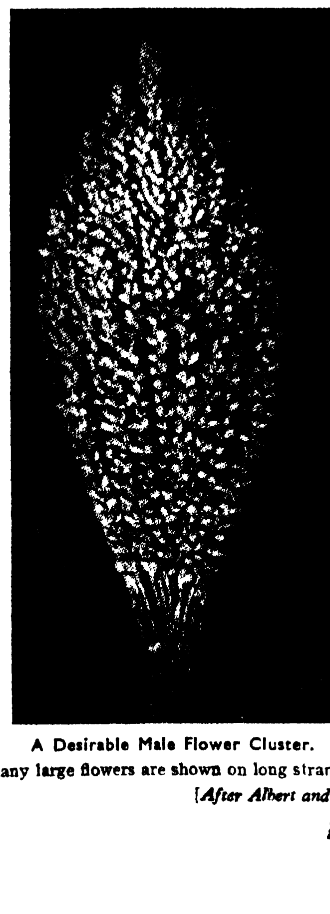
Irrigation.

As an indication of water requirements of the date palm it has frequently been said that for best results it should have "its feet in the water and head in the sun." This is not quite correct, for although considerable water is required it is possible, if the water table be too high, to kill the palms. There are date gardens overseas which are flooded even twice daily, but under these conditions the soil must be exceptionally well drained.

The problem in Australia is more likely to be one of lack of moisture rather than excess.

Pollination.

In commercial date production, hand pollination of the female flowers is carried out. For this purpose it is necessary to



A Desirable Male Flower Cluster.
Many large flowers are shown on long strands.
[*After Albert and Hilgeman.*

have male palms growing and these are usually required in the proportion of one male palm to fertilise about twenty-five females.

The female date flowers have no fragrance, whilst the male has; consequently although the bees visit the males they refrain from visiting the females and so are useless for cross-pollination purposes. Some pollen may be wind-borne, but for this to be successful it is necessary to have a large number of male palms well distributed through the grove.

In hand pollination the male flowers are cut from the palm at the period when the spathe opens. During the period when the female spathe is opening a male branchlet is shaken over the female flowers every three or four days.

Another method adopted is the collection of pollen which is placed in a muslin bag and shaken over the opening female flowers. Date pollen will remain viable for at least twelve months, so that it can be collected and carried over for use the following year if desired.

Harvesting.

Varieties differ in their manner of ripening; in some cases the fruit on the whole bunch ripens together, in others the dates ripen unevenly and it may be necessary to remove individual branchlets or maybe individual fruit. In the case of the whole bunch ripening uniformly picking is easy, but otherwise it will be necessary to hand-pick the branchlets or fruit every two or three days as they become fit for picking.

Experience is required to know just when to harvest the fruit, but it is usually advisable to leave the dates on the bunch until the fruit takes on a light translucent appearance and astringency has disappeared.

With the advent of cooler weather the ripening will be retarded and it may be that this will prevent complete maturation of the dates and they will be useless. When ripening on the palm ceases, the fruit should be removed and, if possible, ripened artificially. To do this satisfactorily requires control of temperature and humidity—a costly process commercially. Under New South Wales conditions at present all that can be done is to spread the dates out on trays and expose to the sun during the daytime and cover at night. Some assistance may be possible, where small household lots are being ripened, by the use of the stove.

New Departmental Appointments.

Manager, Cowra Experiment Farm.—The appointment of Mr. C. Walkden-Brown as Manager, Cowra Experiment Farm, has been announced by the Hon. E. H. Graham, M.L.A., Minister for Agriculture.

Mr. Walkden-Brown, who holds the Hawkesbury Diploma in Agriculture, entered the Department as Assistant Experimentalist in 1929. From 1929 to 1937 he was engaged on experimental work at Hawkesbury Agricultural College, Condobolin Experiment Farm, the Rice Research Station (Yanco), Grafton Experiment Farm and at Parkes.

In 1937 Mr. Walkden-Brown was appointed Agricultural Instructor for the Cowra District, which duties he discharged until his enlistment in the A.I.F. in 1941. In 1945 he took over duties as Acting Manager, Cowra Experiment Farm, which position he held, at the same time coping with his other duties as District Agricultural Instructor, until the present appointment as Manager.

During the war he was instrumental in organising the Cowra Agricultural Machinery Pool, and for some time acted as Chairman of the Cowra District War Agricultural Committee.

Manager, Wagga Experiment Farm.—Mr. S. C. Hodgson has succeeded Mr. A. J. Pinn (retired) as Manager, Wagga Experiment Farm, as from 31st October, 1947.

Mr. Hodgson has had wide experience on the Department's Experiment Farms, as a District Agricultural Instructor, and as an administrative officer on loan in the Commonwealth Departments of Supply and Shipping and of Commerce and Agriculture. Subsequent to Mr. Hodgson's release from the Army (in 1942) at the request of the Government, his services were made available to Messrs. Gordon Edgell and Sons, Cowra, to organise contracts and supplies for maximum production of canned vegetables.

At the end of the war Mr. Hodgson was retained by the Commonwealth as Assistant to the Director-General of Agriculture, Department of Commerce and Agriculture. In this capacity Mr. Hodgson dealt with matters concerning Australian agriculture arising from meetings of the Australian Agricultural Council, and with general matters requiring negotiation between States and the Commonwealth.

INSECT PESTS.

Notes contributed by the Entomological branch.

D.D.T. AND CODLING MOTH.

DURING the past three years D.D.T. has been used extensively, both in experiments by the Department of Agriculture and by commercial growers, for the control of codling moth. The results obtained have been almost universally good and there can be no doubt that D.D.T. is an effective alternative spray for lead arsenate. In spite of these good results, definite recommendations cannot be made until further investigational work and field experience have settled a number of other details.

Injury to the fruit and foliage has, except in a few instances, been unimportant, although recent American experience suggests some reduction in fruit size and lack of colour on D.D.T.-sprayed apples. The main objectionable features have been the associated increases of mite and woolly aphid populations. Fortunately, there has been no build up of San Jose Scale; the evidence rather points to additional scale control following the use of D.D.T. The residue problem also needs further consideration before any definite recommendation can be made for the widespread use of D.D.T. The publicity attendant on the successful war-time use of D.D.T. has led to its very general use on all types of fruit and vegetables irrespective of any specific recommendations. Warnings have been published in the press and in the *Agricultural Gazette* concerning the possibilities of poisonous residues. The tolerance has been tentatively fixed at 7 parts per million, which places D.D.T. on a par with the American allowances for lead and fluorine.

Dormant Sprays.

In view of the possibility of mite or woolly aphid build-up when D.D.T. is used, the dormant spray programme should be carefully considered. Under normal conditions, dormant oils and lime-sulphur are not used annually unless San José scale, red mite or woolly aphid infestations are heavy, and even under such conditions spraying would be confined to particularly susceptible varieties, *e.g.*, Delicious apples.

A dormant oil, 1 in 25, will reduce the red mite population considerably, although in areas where leguminous cover crops are grown re-infestation of the trees may occur when the cover crops commence to hay-off.

Lime-sulphur, 1 in 10, is also a standard dormant spray recommendation for the control of San José scale. Nicotine sulphate, if available, may be used in combination with the lime-sulphur if woolly aphid is a problem.

Semi-dormant oils which are now available may be combined with lime-sulphur. The usual dilutions are semi-dormant oil, 1 in 40, and lime-sulphur, 1 in 25.

The use of D.D.T. has also led to heavy infestations of red spiders (*Eotetranychus telarius* and *Tetranychus urticae*) on pome fruits. These mites overwinter, away from the trees, in the adult stage and are, therefore, not controlled by dormant sprays.

The D.D.T. Programme.

The decision as to whether D.D.T. is to be used must be carefully made by the grower. Generally speaking, growers in localities where codling moth losses are severe will, no doubt, prefer to adopt a D.D.T. programme. On the other hand, in localities where minor losses from codling moth are the rule, lead arsenate can be used without the danger of creating problems of controlling mites and woolly aphid.

Experimental results have suggested that D.D.T. could profitably be used at Bathurst, and could be limited to the later-maturing varieties at Orange. In the Murrumbidgee Irrigation Area well-timed standard lead

groups of from two to seven, and during the summer the incubation period is about six days. More than four hundred eggs may be laid by an individual female.

The young nymphal bugs grow by a series of moults, and cast their skins five times before reaching their winged adult stage. The length of life cycle from egg to adult is about four weeks.

The winter is passed in the adult stage and breeding commences in the early spring.

Control.

As the bugs, in both their nymphal and adult stages, feed by sucking up the sap, they cannot be poisoned like leaf-eating insects by means of such stomach poisons as lead arsenate.

VEGETABLE CROPS.

Control may be obtained by spraying with D.D.T. 0.1 per cent., or with a kerosene-pyrethrum emulsion. The D.D.T. spray has been widely used and is very effective in killing bugs, and also appears to prevent reinfestation for a period of ten to fourteen days.

The kerosene-pyrethrum is prepared by steeping overnight 1 lb. of pyrethrum powder in 1 gallon of kerosene and then making up the extract (which should first be strained through muslin) in the manner usually practised for kerosene emulsion. This may be done by dissolving ½ lb. of hard soap in 1 gallon of heated water and then stirring in and thoroughly emulsifying the gallon of kerosene-pyrethrum extract to form a stock solution. Two gallons of stock solution is diluted with water to make 40 gallons of spray (1 pint of stock solution to make 2½ gallons).

The following dusts may also be used to control the bugs:—

1. D.D.T. 1 per cent.

2. Pyrethrum powder, mixed with an equal quantity of 2½ per cent. nicotine dust. Mix just before use.

3. Pyrethrum powder mixed with an equal quantity of either kaolin or talc.

4. Nicotine dust 2½ per cent.

FRUIT TREES.

Where fruit trees are infested they may be dusted with one of the dusts previously listed, or else sprayed with D.D.T. or a pyrethrum-soap mixture of the following proportions:—

Pyrethrum powder ..	1½ lb.
Soft soap	1½ lb.
Water	40 gall.

This mixture should not be allowed to stand.

If the pyrethrum-kerosene emulsion is used on peach trees there is some risk that it may cause scorching of the foliage.

D.D.T. 0.1 per cent. sprays, have proved generally satisfactory and are likely to become the standard recommendation for control.

The use of D.D.T. sprays or dusts is not recommended on fruit or vegetables ready for harvesting, and an interval of three weeks between final treatment and harvesting is desirable.

Smoke smudging has been practised to drive away the winged bugs, but as this method is laborious and only affords temporary relief, it is unlikely to be used when an effective spray is available.

GENERAL.

A method adopted to prevent the bugs from crawling into cultivated areas is to construct a furrow with a vertical side nearest the crop. The bugs crawl or fall into the furrow, and if holes, about 1 foot in depth, are dug in the bottom at intervals of about 15 feet, the bugs collect in them and may be readily destroyed by treating with one of the dusts or sprays listed.

Another method is to spray a band of crude creosote or wood-preserving oil or thin tar along the ground on the edge of the area.

As the bugs breed amongst various weeds, clean cultivation or attention to turning the weeds in at an appropriate time may prevent the building up of a serious infestation. In coastal areas, egg-laying commences in August and young bugs feed on the weeds during September. If the weeds are then destroyed, the bugs move into nursery stock, vegetable crops or other available food plants. Cultivation before the August egg-laying or preferably the sowing of a winter cereal or legume which does not act as a breeding ground, would keep the bug population to a minimum.

(Continued on page 599.)

Now is the time!!

Rucide proved itself last season as an outstanding control for

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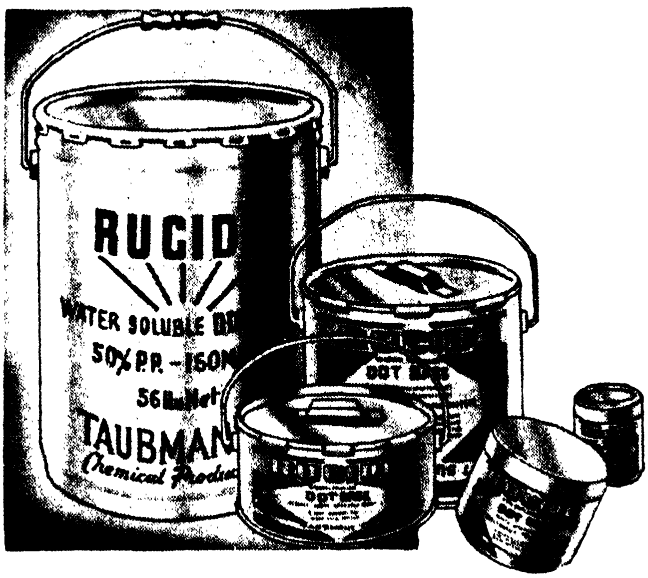

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The Menace of—

THE SPREAD OF MINT WEED

A Plant Poisonous to Sheep and Cattle.

A. PEARSON, H.D.A., Weeds Officer.

ALTHOUGH mint weed has been gradually spreading in New South Wales during recent years, observations have shown that in the last three or four seasons the weed has spread much more rapidly, and in some districts where a few years ago there were only small patches, there are now paddocks of hundreds of acres in which mint weed is the dominant plant during the summer months.

At present, mint weed infestations are confined particularly to north-western districts, although individual plants have been found in practically all agricultural areas of the State. Mint weed is a proclaimed noxious weed in all shires and municipalities of New South Wales.

This weed has been very troublesome in parts of Queensland, and it is quite apparent that unless concerted action is taken by New South Wales farmers and graziers the spread of this weed in this State will have serious repercussions.

Unfortunately, the weed gained much ground in New South Wales because of the distribution, during the summer of 1946-47, of weed seed in seed of fodder crop plants purchased by farmers for planting in various parts of the State. The Department of Agriculture has taken steps to ensure that mint weed is not further distributed in agricultural seeds offered for sale, but farmers should keep a careful watch to ensure that this apparently inoffensive plant does not gain hold on their properties.

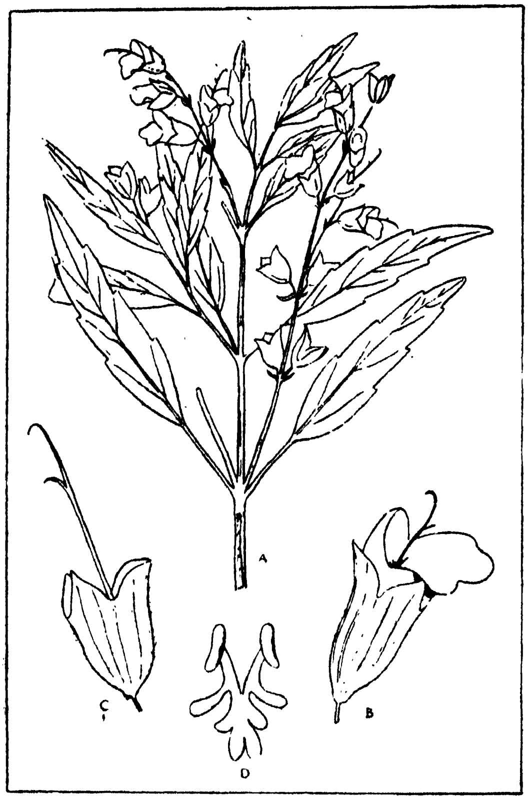
Description of the Weed.

Mint weed is an erect, annual, greyish-coloured plant 1 foot to 2½ feet high. The stems are square, and in young plants are covered with short, stiff hair. The leaves, on slender stalks up to ½ inch long, are arranged in pairs on opposite sides of the stem and are oblong or lance-shaped, usually 1 to 2 inches long and up to ½ inch broad with the edges toothed. The flowers are blue or lilac, small, two-lipped, opposite or in small clusters forming slender sprays

A Heavy Infestation of Mint Weed in the North-west of New South Wales.

at the ends of the branches. The fruit consists of groups of four nutlets or seeds enclosed in a five-toothed cup left after the flower has fallen. When mature, this cup is straw-coloured and has the appearance of a small bell. When crushed the whole plant has a strong, rather sage-like odour.

The seed of mint weed has a dull smooth surface, is fawn to cream and about 1/10 inch long and about 1/20 inch wide. On one side the seed is convex and on the other side it is tapered to a central ridge. In summer fodder crop seed which has not been thoroughly machine cleaned, it may be present as clean seed or it may be present in the small 5-toothed, bell-shaped seed container.



Mint Weed (*Salvia reflexa*).
A.—Upper portion of plant, showing flowering habit.
B.—A solitary flower. C.—Calyx tube and style.
D.—Stamens.

Control by Cultivation.

This weed is an annual, and despite the fact that it is very free seeding, it is possible to eradicate it from arable land by cultivation during the summer months. If good summer rains are received it must be expected that several crops of seedling plants will appear on infested country where attempts are being made to kill the plant out by cultivation. It is, of course, necessary to kill out all seedling plants by cultivation immediately they appear.

Use of Summer-growing Grasses.

Practical experience has shown that mint weed is very definitely encouraged by overgrazing and rabbit infestation, and any action which will lead to an increase in the density of the natural pasture sward will assist in the eradication of this plant.

In Queensland it has been shown that liverseed grass (*Urochloa panicoides*) will crowd out mint weed. It is not known whether liverseed grass will prove suitable for the eradication of mint weed in New South Wales, but experimental work is being undertaken by the Department in the north-west this summer with a view to ascertaining if it is practical and economical to endeavour to control mint weed by the use of this or other summer-growing grasses.

Chemical Sprays.

It has been shown that mint weed can be killed by the use of several different types of chemical sprays. Good kills have been obtained with arsenic pentoxide, sodium chlorate, dinoc and the new hormone type sprays. The latter sprays are, of course, non-inflammable and non-poisonous, and while it is not suggested that it would be a practical proposition to endeavour to kill large areas of mint weed by the application of chemicals, it is suggested that scattered areas of the weed could be effectively and economically treated by the use of any of the sprays named. With arsenic pentoxide and sodium chlorate a 5 per cent. concentration is recommended. With dinoc, a 2 per cent. concentration, with the addition of sulphate of ammonia as an activator, and with the hormone type sprays a concentration of 0.2 per cent. of the active principle, is recommended.

The distribution of mint weed indicates that the weed thrives best on the heavier soil types, and it is not anticipated that the weed will become really troublesome other than on the better class grazing lands of a heavy nature.

Mint Weed is Poisonous to Sheep and Cattle.

Practical experience in both Queensland and New South Wales, which has been confirmed by laboratory tests and feeding

experiments, shows that mint weed is very definitely poisonous, and that both cattle and sheep are susceptible. At the same time it is pointed out that, in districts with heavy infestations of mint weed, both sheep and cattle are frequently to be seen grazing, without ill-effect, in paddocks with dense growths of the plant.

Poisoning generally occurs when hungry animals come in contact with the weed. Several cases have been reported of heavy mortality in travelling stock where the stock have been actually raised on mint weed-infested land. It appears that when stock are normally running on land carrying the weed they do not graze the plant, but the same animals will consume mint weed with fatal results when they have been travelling on the road for a few days.

Some landholders have formed a false impression regarding the poisonous properties of the weed as a result of seeing stock in badly-infested paddocks, but during the past summer there were several instances of very heavy stock losses with both travelling sheep and cattle as a result of encountering the plant on stock routes, or being turned, when hungry, into paddocks carrying the weed.

Learn to Identify This Weed.

Landholders should endeavour to acquaint themselves with the appearance of this apparently inoffensive plant to ensure that it does not become established on their properties, as once it has gained a hold, a considerable expenditure of time and money will be necessary before the properties are again free of the plant.

Haymaking—*continued from page 584.*

that form or as chaff, particularly if ergot is plentiful.

Cut early and evade trouble is a sound recommendation to the paspalum haymaker.

Grass Hay Compared with Cereal Hays.

Some analyses of grass hays will be given in a subsequent section of this article. It will be seen that grass hays compare more than favourably with cereal hays in their feed value as indicated by chemical analysis. It should be borne in mind though, that the conditions under which a hay was grown and cured may account for tremendous differences between different samples, and a poor sample of grass hay is no better than a poor sample of hay from any other crop.

(To be continued.)

Insect Pests—*continued from page 596.*

In inland areas the early turning in of cover crops or rubbish, usually not later than mid-October, has resulted in undamaged fruit crops. Growers who do not turn in the cover crops until well into November breed up a large population of bugs which later cause serious losses to stone fruits.

Kikuyu as a Preventive of River Bank Erosion.

AN interesting feature of departmental pasture experiments in the Lower McDonald (St. Albans) district is a trial demonstrating the usefulness of kikuyu grass in preventing erosion of river banks.

Despite the fact that the water is brackish all of the year, and when tides are exceptionally high is very saline, this grass is persisting—even though the lower sections are covered with up to 2 feet of water twice a day. Although the top growth of the inundated grass suffers to some extent, the underground runners persist and send up fresh growth. The grass roots are planted about 3 feet above high water mark, and the kikuyu runners form a thick mass along the river bank, holding it firmly together.—J. N. WHITTET, Principal Agronomist (Pastures).

THE GROWING OF SPROUTING BROCCOLI

A Delicious Vegetable

For Which the Demand Is Increasing.

CONTRIBUTED BY DIVISION OF PLANT INDUSTRY.

FROM the standpoint of quality and productiveness there are very few vegetables to equal sprouting broccoli, and it is difficult to understand why it is not more widely grown by both home and commercial growers. This vegetable has been grown in a small way by a few Sydney Metropolitan growers for a number of years. Its delicious succulence is beginning to be more generally recognised, and the existing small market demand for green sprouting broccoli is gradually expanding.

Sprouting broccoli is an excellent vegetable for home garden as it is easily grown, has a very high content of vitamins A, B2 and C, and contains appreciable amounts of calcium and phosphorus. In addition it produces sprouts over a period of several weeks, as after the central head which may be 3 inches to 8 inches in diameter has been harvested, the plant continues to produce a large number of secondary sprouts up to 3 inches in diameter.

Climate and Soil.

Generally speaking the climatic and soil requirements of sprouting broccoli are very similar to those of cauliflowers. It is a cool climate plant and must be grown during the autumn and winter months. If grown during the warm months the sprouts become tough and unpalatable.

The soil should be well drained and well supplied with organic matter. Rich alluvial soils are the most suitable, but this vegetable is very adaptable and may be successfully grown in most districts of New South Wales.

In recent years the crop has been grown very successfully for quick freezing by a few growers in the Hawkesbury district, while on the Murrumbidgee Irrigation Area, where the crop was grown experimentally at Leeton Experiment Farm, the yield and quality of heads were satisfactory.

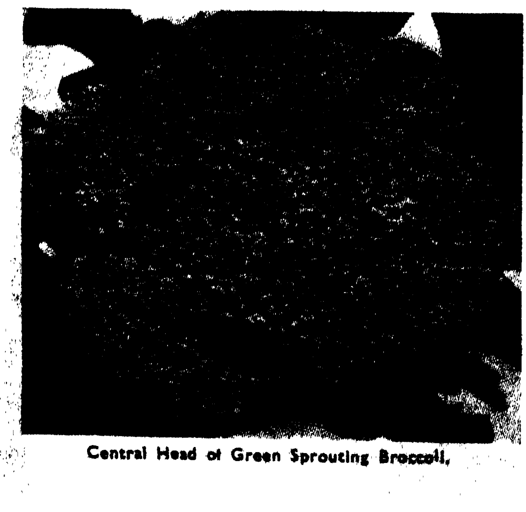
Free working sandy loams are preferable for early production, while the heavier clays and loams are most suitable for large yields of late maturing crops. Broccoli thrives best in soils that are only slightly to moderately acid (pH 6.0 to 6.5). Soils that are decidedly acid (pH 5.4 or less) should be limed for broccoli.

Early and Careful Preparation is Necessary.

It is advisable to commence preparing the land early. The soil should be worked deeply at first and by discing and harrowing reduced to a fine, moist and weed free condition for transplanting. Should the soil be acid, dolomite or lime at 30 cwt. per acre should be added during the final preparation. Animal manure at the rate of 10 to 15 tons per acre should be applied to soils deficient in organic matter. As an alternative green manuring is recommended.

Raising the Seedlings.

The seedlings are easily raised, the technique used for cauliflowers being applicable to sprouting broccoli. Sow the seed thinly in an open seed-bed, comprising virgin soil which has received a thorough preparation, in rows 6 to 8 inches apart and about ½ inch



Central Head of Green Sprouting Broccoli.

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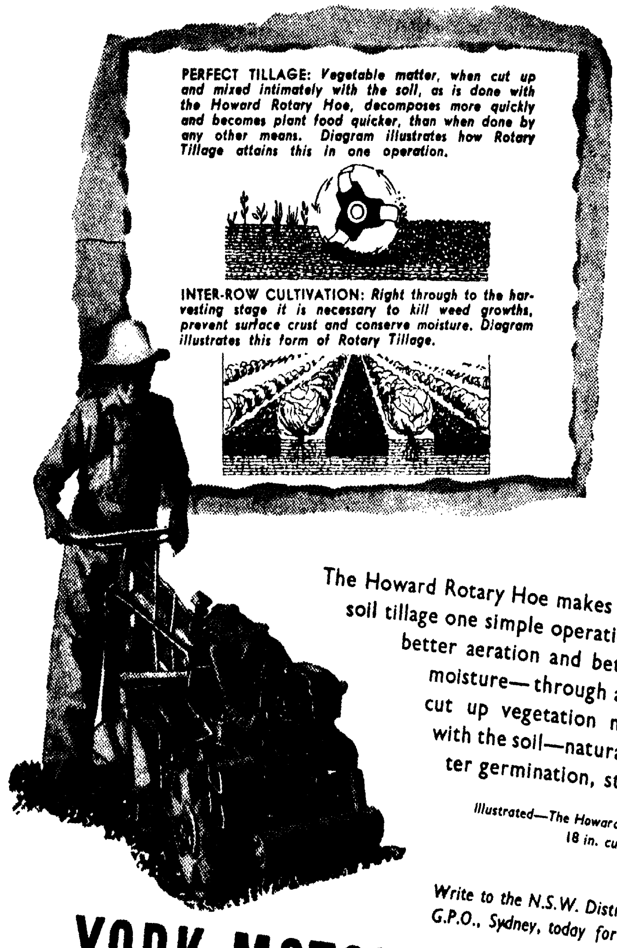

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deep. Prior to sowing the soil should receive a light dressing of superphosphate—1 oz. per square yard. The surface should be mulched with finely divided horse manure and watered with a fine spray after sowing.

The plants in the seed-beds should be dusted regularly with 2 per cent. D.D.T. to control grubs of cabbage moth and cabbage butterfly, and in addition should be thoroughly dusted or sprayed with nicotine to destroy all aphids before being planted out. As a further precaution against aphid infestation, the plants, as they are lifted from the bed, may be made into bundles and the tops washed in soapy water containing nicotine sulphate (1 fluid oz. to 4 gallons).

Plants will be ready for transplanting five to six weeks after sowing the seed. Sprouting broccoli may be sown in coastal districts from December for April production until March. In Tableland districts seed should not be sown later than January, but in most inland districts sowing may be carried out until February.

Transplanting and Fertiliser Treatment.

Irrigation facilities should be available for broccoli, and the plants should be set in ground well supplied with moisture. When the seedlings are about 6 inches high they should be set out in the field 2 feet to 2 feet 6 inches apart, in rows 3 feet apart.

The use of artificial fertiliser is recommended. The best method of applying the base dressing is to open up a drill 6 inches deep along the row where the plants are to be set out and distribute the fertiliser along the row. The fertiliser should be thoroughly mixed with the soil by running a hand cultivator along the row, or with a rake. The plants are then set out along the fertiliser line. The fertiliser also may be broadcast and worked into the soil before transplanting.

Another method is to open up shallow drills to a depth of 3 to 4 inches with a single furrow plough, run irrigation water down the furrows, and then set the seedlings out in the moist soil on the side of the furrows. The fertiliser is spread along the bottom of the furrows. When the plants have become established the drills are filled in by cultivation. As the plants develop the irrigation furrows are gradually moved to the centre of the rows.

A mixture consisting of four parts superphosphate and one part sulphate of ammonia, or a complete fertiliser containing 5 per cent. nitrogen, 10 per cent. phosphoric acid and 5 per cent. potash applied at 8 or 9 cwt. per acre should be found beneficial. The complete fertiliser is recommended for the coastal sandy soils, where dressings of 10 to 15 cwts. per acre may be necessary.

When the broccoli sprouts begin to develop, plants should be given regular side dressings every three weeks, of sulphate of

A Head of Broccoli Ready to Harvest.
[*After Thompson.*

ammonia or nitrate of soda at the rate of about $1\frac{1}{2}$ cwt. of fertiliser per acre. These side dressings have a stimulating effect on the plant, and increase the yield and prolong the cropping period.

Cultivation and Irrigation.

At no time during the growth of the crop should soil moisture be allowed to become so reduced as to provide a check to the vigorous growth of the plant. The crop should be cultivated as required to control weeds and to provide a loose mulch on the surface. Cultivation should be shallow in well grown plants to avoid injuring the roots. When the

crop is about half grown, hilling to prevent the plants being blown over by wind is usually desirable.

Harvesting and Marketing.

The central head develops first and the sprouts are ready for cutting just before the first buds begin to show yellow. Under no circumstances should harvesting be delayed beyond the full bud stage, as the sprouts lose their palatability if allowed to become over mature.

The sprouts, together with about 6 inches of the stem, are removed by cutting with a knife, while still compact and firm. Secondary sprouts, which develop below the central one, continue to develop and the harvesting period may extend into the spring.

Sprouting broccoli easily perishes, and quickly becomes unsaleable in hot weather. The heads should be cut in the cool of the day, graded, packed in paper lined crates or cases, and immediately marketed. The secondary heads may be marketed in 2 lb. bundles. It is not advisable to have the crop maturing in the warmer weather because the sprouts and stem become tough and lose palatability.

The most suitable variety is Green Sprouting, seed of which is available from most seed merchants.

Diseases and Pests.*

Pests and diseases common to cabbage and cauliflowers also attack broccoli.

Aphids which infest the heads are the most serious pest and nicotine dusts or sprays should be applied regularly. A 2½ per cent. D.D.T. dust or a 0.1 per cent. D.D.T. spray may be used to control grubs of cabbage moth and white butterfly. D.D.T. should not be applied to well grown heads close to harvesting.

*Supplied by Entomology and Biology branches respectively.

The most common and important disease of broccoli is black rot, a seed-borne bacterial disease. Other diseases are damping-off, wire stem and root rot caused by the fungus *Rhizoctonia solani,* Sclerotinia rot, club root, downy mildew and Alternaria leaf spot. Seed treatment, the use of clean soil for the seed bed, spraying of the seedlings in the seed-beds and crop rotation, will usually give effective control of these diseases.

Unless the seed is known to be disease-free, it should be treated for 18 minutes in hot water at 122 deg. Fahr. The soil used for the seed-bed should be virgin soil, sterilized soil or soil which has not grown broccoli, cabbage, cauliflower or other members of the crucifer family for some years. Information on seed treatment and on the sterilization of seed-bed soil is available in Plant Disease Leaflets from the Department.

If the season is wet, it is advisable, in order to prevent the development of downy mildew and to give some control of damping-off and wire stem, to spray the seedlings in the seed-bed with Bordeaux Mixture 1-1-10 plus white oil, at the rate of 2 fluid ounces of white oil to each gallon of spray.

Wherever possible, a rotation of crops should be practised, and broccoli should not be grown more frequently than once in every three or four years in land which has carried this crop or other members of the same family (cabbages, cauliflowers, etc.). Where the soil has become infested with the club root fungus, the soil should be treated with lime at the rate of up to 3 tons per acre before planting.

Further information on disease control is available in Plant Disease Leaflet No. 87.

Renovation of Grazing Lucerne.

WHILE renovation of lucerne is generally recommended for the spring, no good purpose will be served doing this work at present on areas where useful pasture species such as burr and other annual clovers, crowfeet, and other herbage plants are plentiful amongst the lucerne.

In many of our inland lucerne areas volunteer growth of these useful plants occurs in profusion, and it would be unwise to destroy much of the rapid growing forage by renovation.

Provided the stands receive at least one renovation a year, it is immaterial whether such working is given in the autumn or spring. Where these annual plants are not plentiful or are absent, the best time to renovate is just prior to the commencement of vigorous spring growth.

Whether the work is done in spring or autumn, it should only be carried out after rain has softened the surface soil. This will help the horses and result in better penetration of the implement.—J. N. WHITTET, Principal Agronomist (Pastures).


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A Well-sheltered, but Sunny Site.

Apiary Notes.

W. A. GOODACRE, Special Livestock Officer (Bees).

THE PROGRESS IN BEE-FARMING.

THE bee-farming industry in New South Wales has made considerable progress during the past six years. The most noticeable extension has been an increase in the number of hives operated by individual bee-farmers, rather than an additional number taking up the business. No doubt the many young men absent on war service were responsible for this particular trend in the industry. Although no reliable statistical figures showing the actual increase in production of honey and beeswax have been available of late years, it may be accepted that an additional 2,000,000 lb. of honey and about 40,000 lb. of beeswax per annum is now being produced, compared with six years ago.

An Improved Plan for Collecting Statistics.

The problem of the obvious need for a means of securing reliable statistics has been solved by the passing of the amended Apiaries Act, which amongst other important measures, enforces annual registration of apiaries. The Department is now co-operating with the Government Statistician by distributing statistical forms along with applications for apiary registration which become due on 31st March each year. The completed forms are returned with the apiary registration renewals. They are collected in bulk at the Department and handed to the Government Statistician to allow of the necessary figures being compiled.

This method is proving very satisfactory, and statistics for the year ended 31st March, 1947, for New South Wales which are of considerable interest, are as follows:—

Year, 1946–47.

Number of beekeepers ...	2,440
Nuclei hives	22,803
Productive hives... ...	93,622
Unproductive hives ...	29,506
Honey produced	9,016,638 lb.
Beeswax produced ...	111,916 lb.

The above figures give a reliable guide as to the present position of the industry. The season was fairly good for honey-production, but dry conditions in a number of prominent districts limited the duration of honey flows.

Very few people realise that, notwithstanding these conditions, 123,000 hives of bees are in operation, and 9,000,000 lb. of

honey, valued about a quarter of a million in cash, was produced in one fairly good season.

Problems of Establishment.

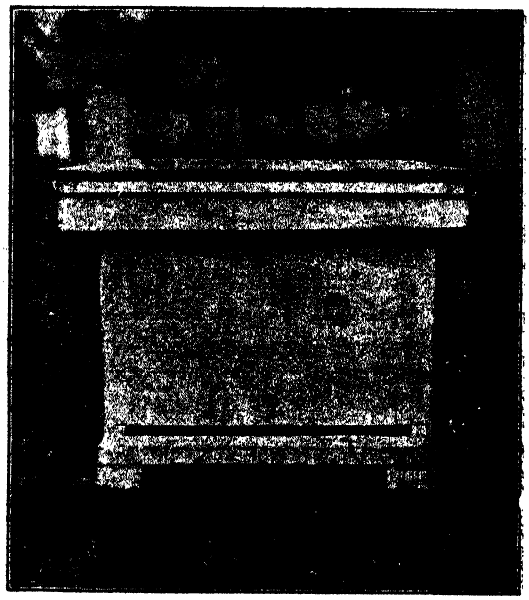
Although the bee-farming industry has made this very noticeable progress in recent

Preparing Hive Material.

years, it is becoming more and more difficult for a young intending apiarist to establish himself. He must be imbued with a determination to overcome any obstacles which he may come up against in gaining additional experience, in keeping up with recent trends in the industry, and in contending with the extreme shortages in material supplies, etc.

There is certainly no easy road to bee-farming as a business. In the first place, as compared with a few years ago, a more extended knowledge of the flora is required —particularly in relation to the honey and pollen flora in districts, outside the home area, in which it is likely that migratory work will be practised. Whilst it is not desired to convey the opinion that full time migratory bee-farming is always necessary, the aspiring bee-farmer should keep in mind that occasions do arise where it becomes advisable, for economic reasons, to move the bees to other districts. To become properly qualified as a producer, therefore, he should have at least one full season of practical experience on a bee farm on which some migratory work is done. In addition to this, of course, a very close study of the management of bees in all its various phases and a keen interest in the work are essential to success.

Taking the view that some migratory work will be required, it is necessary to take the cost of the purchase of a motor vehicle into account when assessing the cost of plant. This, together with increased prices for all apiary and honey-house equipment, means that it is now more costly to build up a bee-farming business. In view of this the young man with limited capital may be



A Well-constructed Home-made Hive.

forced to take more time than hitherto to become established, making the bees pay for some of the equipment necessary in the apiary extension work. To go straight into bee-farming as a business after gaining the experience, a capital of at least £1,000 is now required.

Materials are Difficult to Obtain.

At the present time it is most difficult to secure factory-made hives and frames and nucleus colonies in sufficient numbers at the right time of the year, and this is an instance in which the right attitude and a determination to proceed and overcome such difficulties are essential to success. Some limited supplies of complete factory-made

hives are obtainable, but it is necessary to investigate every avenue where suitable timber may be secured. Timber merchants, saw-millers, and any likely sources of packing cases made up of useful boards, should be visited from time to time. When timber or case-boards have been secured, it is advisable to install a small, power-driven circular saw to make up the material. The making of frames is the most difficult job, and recognising the importance of frames, manufacturers of beekeepers' supplies are endeavouring to keep up supplies, even though it means limiting the output of hive bodies and other parts. Nevertheless, the aspiring bee-farmer must keep in mind that he may be forced to make some frames—even though it is tedious and exacting work.

To Secure Bees.

To secure colonies of bees, it is necessary to place orders for nucleus colonies with bee-breeding apiarists, and it is also desirable to ascertain whether a number of established well-hived colonies can be secured locally by advertising. In regard to the latter, it is essential that the beekeeper be experienced, and competent to make a complete inspection to assess the value of the bees and material, and to ensure that no brood disease is present. In securing the required number of colonies of bees there are bound to be some disappointments and delays, and patience and persistence are required—qualities which are desirable if the beginner is later to become a successful bee-farmer.

CERTIFICATES FOR INTERSTATE SALES.

Obtainable from Departmental Officers.

Beekeepers or any other persons or firms sending bees, beeswax, bee combs, or honey to Queensland or Western Australia are reminded that it is necessary that a certificate accompany the consignment. Forms for the purpose are obtainable from the Department or from officers in country districts who are authorised to sign certificates. The names and addresses of these country officers are given at the end of these notes.

There is very limited movement of bees—mainly of queen bees—to Western Australia, but there is a considerable call for certificates to allow of export of honey and hives of bees to Queensland. On occasions, consignments are held up at the border as a result of failure to secure a certificate, causing much delay and other inconvenience to all concerned, including railway officials.

Certificate forms should be made out in duplicate. The sender's portion being completed and the declaration signed, the certificate is then forwarded to the Department or authorised country officer for signature. Should the issue of the certificate be in order as required by the Queensland Apiaries Act, one copy signed by an approved officer will be returned, and this should accompany the consignment. The duplicate copy is retained for Departmental records and audit purposes.

Fees for Honey Certificates.

There is no fee for certificates issued in connection with the forwarding of bees, beeswax or appliances, but the scale of fees for honey is as follows:—

1s. 6d. for any one consignment to 120 lb.

2s. 6d. for any one consignment from 121 to 489 lb.

5s. for any one consignment over 480 lb.

A remittance, postal note, money order, or cheque with exchange added, made payable to the Department of Agriculture, should be forwarded with the application.

The northern areas of New South Wales, where the bulk of honey going forward to Queensland is produced, are particularly free of diseases, and arrangements have been made to notify all authorised officers of any change in the position which may affect the issue of certificates.

Officers Authorised to Sign Certificates.

The names and addresses of officers authorised to issue certificates who reside in country centres are as follows:—

Mr. F. Ainsworth, Inspector of Stock, Box 155, P.O., Stanthorpe, Queensland.

Mr. S. J. Claydon, Relieving Border Inspector, Stanthorpe, Queensland.

Mr. N. F. Woodworth, Relieving Border Assistant, c.o. F. Ainsworth, Box 155, P.O., Stanthorpe, Queensland.

Mr. E. L. Carpenter, Border Crossing Inspector, Wallangarra, Queensland.

(*Continued on page 612.*)

Scholarships at Hawkesbury Agricultural College.

THE Minister for Agriculture, Hon. E. H. Graham, M.L.A., has announced that the Government Farrar Scholarship and the Scholarship provided by the Agricultural Bureau of New South Wales, both tenable in the Agricultural Diploma Course at Hawkesbury Agricultural College, Richmond, will be open for competition in January next.

Candidates will require to have passed in at least seven subjects of the syllabus prescribed for the Intermediate Certificate Examination, and the award of the Scholarships will be determined mainly on the aggregate marks obtained in three "externally examined" subjects at that Examination, namely:—

(*a*) English.

(*b*) Mathematics I or Mathematics II or General Mathematics.

(*c*) One subject other than mathematics selected by the candidate.

Consideration may also be given to a candidate's additional educational qualifications and to his aptitude, fitness, physical strength and other qualifications necessary to become successful in agricultural work.

The Scholarships will be open for competition amongst candidates who are not less than sixteen or more than nineteen years of age on 3rd February, 1948, and who are natural-born or naturalised British subjects. Candidates, or their parents, must have had six months' continuous residence in this State immediately prior to 3rd February next.

The Scholarships cover the fees and deposit prescribed for the Course together with text books and other legitimate College expenses up to an amount of £40 per annum in each case. Any charges or expenses in excess of that amount must be met by the scholars.

The duration of the Scholarships is three years in the case of holders entering the first year of the Diploma in Agriculture Course and two years for those entering the second year.

Applications from persons desirous of competing for the Scholarships must reach the Principal not later than 5th January, 1948. Further particulars are obtainable from the Under Secretary and Director, Department of Agriculture, Sydney, or from the Principal of the College.

Imported Dorset Horn and Border Leicester Rams.

To Serve Privately-owned Ewes.

DORSET Horn and Border Leicester stud rams purchased for the Department of Agriculture by the New South Wales stud stock buying delegation which visited overseas countries last year are to be made available this season for service of ewes of registered stud breeders.

Announcing this decision, the Minister for Agriculture, Mr. Graham, who was leader of the stock buying delegation, said that one of the two Dorset Horn rams had already been tested on stud ewes at Wagga Experiment Farm.

Although purchased primarily for use in the Wagga Farm stud, said Mr. Graham, the decision to make this first-class Dorset Horn ram, "Idlecombe 21" available for service of privately-owned stud ewes would ensure wider and quicker spread of the benefits of this importation.

The second Dorset Horn ram arrived from England early in October. After release from the statutory quarantine, this ram would be stationed at Cowra Experiment Farm, where it would also serve a limited number of ewes from private breeders. The mating season for this ram at Cowra could not commence until after the middle of November, said the Minister.

The Border Leicester ram, "Preston Explorer," will be available for service of stud ewes at Trangie Experiment Farm, and the ram, "De Luxe" at Wagga Experiment Farm. The mating season for these two rams will be March-April, 1948.

Not more than five ewes from any one breeder will be accepted for service by each ram. Service fee for each ewe will be two guineas, and application forms and other particulars are available on application to the Under Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney.

Eggs with Olive-coloured Yolks.

REPORTING recently on specimens of eggs with olive-coloured yolks submitted by the Poultry Section of the Department for bacteriological examination, the Chief Biologist stated that the eggs had proved to be bacteriologically sterile, and that the cause of this type of discolouration appeared to be related to certain feed consumed by fowls. It had been claimed by investigators that, in some cases at least, ferric iron derived from the yolk proteins combined with specific components of the feed and resulted in intense colour development. Rations which had been implicated in this defect included linseed, soybean and cottonseed meals, acorns, wattle beans, and crops of mustard, shepherd's purse and field pennycress.

FEEDS AND FEEDING NOTES.

Contributed by The Division of Animal Industry.

PRESERVATION OF SEPARATED MILK FOR CALF FEEDING.

G. L. MCCLYMONT, B.V.Sc., Veterinary Research Officer, and R. P. PAXTON, Manager, Barnardo Farm Home, Picton.

ONE part of formalin to 1,000 to 2,000 parts of separated milk has been found to be a cheap, safe and effective method of preserving separated milk for feeding to calves.

In the area from which the Milk Board draws supplies of whole milk (the Milk Zone), on block days—when milk is not accepted by the Board—usually a large quantity of separated milk is available on the farms. Usually the dairy farmer must dispose of this as quickly as possible to his calves (pigs being rarely kept in the Milk Zone) before it clots and putrefies, block days occuring practically only in the spring and summer. Used in this manner, *i.e.*, a large quantity fed over two or three days, the separated milk is of relatively little value, and does not materially assist in calf rearing or reducing the cost of meals and milk substitutes for the calves.

Glenfield Experiments.

Experiments carried out at the Glenfield Veterinary Research Station to find a cheap, non-poisonous easily available preservative for separated milk, resulted in selection of formalin, used at the rate of 1 part to 1,000 or 2,000 parts of milk, the higher concentration, 1 in 1,000, being advisable during very hot weather.

This amount of formalin was found to keep separated milk, stored in a fairly cool room, for up to ten or even more days, depending on the weather, without any clotting or putrefaction or effect on the palatability of the milk for calves. After some days, the milk may have a slight "cheesy" odour, but it does not appear to affect its palatability.

Calves Successfully Reared.

A number of calves have been reared at the Barnardo Farm Homes, Picton, and on a number of neighbouring farms with this formalin-preserved separated milk—in some cases the calves being fed milk preserved for as long as sixteen days. No ill-effects such as scouring (which is not unexpected as formalin has been used for treatment of scours in calves), have been observed, and the calves have appeared to grow quite normally. However, in the absence of definite evidence that it is not harmful to very young calves, it is not recommended to feed formalin-treated milk to calves under one month of age.

The Procedure Recommended.

The advised practice, when block days occur, is to separate the milk, cool it, add 1½ to 3 tablespoonfuls (¾ to 1½ fluid ounces) of formalin to each 10-gallon can of separated milk, the amount depending on the weather, and stand the cans with lids only loosely fitted to ensure access of air, in a cool room. About ½ to 1 gallon is fed per day to each calf.

A supplement of grain and good pasture or hay is all that is needed with the milk to ensure good growth, whereas without the milk, more expensive meals containing, preferably, dried milk products, and scarce high protein concentrates are necessary.

Poultry Notes.

November, 1947.

E. HADLINGTON, Principal Livestock Officer (Poultry).

BE PREPARED FOR HEAT WAVES.

WITH the approach of summer the possibility of heat waves occurring should not be overlooked. Newcomers to the industry, especially, should make themselves familiar with the methods of management required under these circumstances.

It should be realised that with reasonably good houses, and by adopting suitable precautions, the losses can be reduced to a minimum, but unless frequent inspections of the birds are made when the temperature rises much above 100 deg. Fahr. in the shade, a heavy death rate may occur.

An important factor in reducing losses is an adequate supply of water for the birds to drink, and it should be as close to the houses as possible so that the birds do not have to go out in the heat for it.

During very hot days regular inspections of the pens should be made, especially after midday, and if any birds, upon being disturbed, appear to be prostrated with the heat, they should be removed from the pen and held under a water tap to wet their heads and under their wings. They should then be placed in a shady spot, preferably where there is a draught and where the ground has been thoroughly wetted. If the birds are treated as soon as they are affected they will recover in a short time, but advanced cases may require several applications of water and take a few hours to show improvement.

On extremely hot days, particularly when a hot wind is blowing, it may be necessary to wet the floors of the houses, but if litter is used on the floors and it becomes saturated, it is advisable to clean out the pens before night, otherwise a humid atmosphere will be created which may result in further trouble.

When a heat wave lasts for several days, it is advisable to reduce the amount of feed given to the birds as they will stand the heat better if not overfed.

When there are indications of a heat wave, it is essential that sufficient labour be available to cope with the work of attending to the birds, and it is not wise for the owner to leave the farm unless someone experienced in the management of birds is left in charge.

Research Work at Poultry Experiment Farm, Seven Hills.

AT the Field Day held at the Poultry Experiment Farm on 9th October, an outline of the research work carried out and contemplated was given, and, for the benefit of those who were unable to attend, the particulars are set out below.

Riboflavin and Hatchability.—This work has demonstrated the importance of an adequate amount of riboflavin in breeding rations for high hatchability. Deficiency of this vitamin is most acute in rations with high proportions of grain and crushed grain. Milk powders, lucerne meal, green feed and synthetic riboflavin are the main sources of riboflavin (see Poultry Experiment Farm Extension Bulletin No. 1, "Nutrition and Hatchability").

Vitamin A and Hatchability.—This work has shown that vitamin A, which prevents "nutritional roup" or green feed deficiency disease, is not essential for hatchability. Where only limited green feed is being fed, but sufficient to prevent green feed deficiency disease, no benefit as regards hatchability is obtained by feeding vitamin A-rich fish oils. Extra riboflavin-rich supplements are required (see Poultry Experiment Farm Extension Bulletin No. 3).

Single Grain System of Feeding.—These experiments have shown that whole wheat and meat meal from separate hoppers, with green feed, gives production which is perhaps slightly lower than that obtained from wet-mash feeding, but may be useful where no mill offals are available.

Comparison of Wet Mash, Dry Mash and All-Mash Systems of Feeding.—This experiment, carried out over eighteen months with 900 birds, has indicated that up to the laying stage there is no difference as regards growth or economy of feeding. Over twelve months' laying there was no significant difference between the egg production from wet and dry mash, but all-mash feeding was not as good as either of these two systems.

High and Low Protein Rations for Chickens.—This experiment, carried out as part of the above feeding system experiment, demonstrated the value of rations with adequate protein (about 20 per cent. to six or eight weeks).

Toxicity of Linseed Meal for Chickens.—Our experiments have shown that either all solvent extracted or pressure extracted linseed meal can be satisfactorily fed up to 10 per cent. of the rations for day-old chickens, but that over this level may decrease growth and cause losses.

Grain Sorghum for Chickens.—Results last year indicated that with rations containing very little else besides wheatmeal or grain sorghum meal, the wheatmeal was superior to the grain sorghum. Further experiments are now in progress to determine the value of grain sorghum in more practical type rations.

Breeding Pens used for Progeny Testing at Seven Hills Poultry Farm.

Grain Sorghum Rations for Laying Stock.—This experiment, still in progress, indicates that grain sorghum and wheat are equivalent for egg production, the grains being used whole for the grain ration and crushed for 50 per cent. of the mash.

Synthetic Riboflavin as a Replacement for Milk Powder, Lucerne Meal and Mill Offals.—This experiment in breeding rations is designed to determine whether synthetic riboflavin can be completely replaced by these natural vitamin supplements for hatchability, livability and growth of the chickens.

Hormone Fattening of Poultry.—Overseas results have indicated that synthetic hormones fed to old hens and roosters will improve carcase quality. Our experiments to date have indicated that old hens and cockerels so treated will greatly improve in carcase quality, but that there is danger of accumulation of these hormones in the fowl's body which might affect the consumer.

Progeny Testing Imported Stock.—It has become evident from practical experience and research that the present widely-used methods of selection of stock for breeding are not further improving flocks to any degree. It is recognised that only by progeny testing, that is, checking how birds are breeding by actually testing their progeny, can substantial further progress be made.

A large-scale progeny-testing project has been initiated at this Farm, the purpose being to develop practicable methods of progeny testing for application on commercial lines and for producing progeny-tested stock for sale to the public. In 1946, twenty White Leghorn cockerels were mated with twenty lots of twelve White Leghorn pullets, and the progeny of these cockerels are now being tested for egg production, egg weight, mortality, economy for food utilisation, etc.

This year ten White Leghorn cockerels hatched from eggs of the progeny-tested stock imported from the Beltsville Animal Husbandry Station of the U.S.A. Department of Agriculture, have been mated to our own stock, as well as to the American-bred pullets. Ten groups of our own strain of Australorps are also being tested.

Drip-Nipple Watering System.—This system of watering poultry has been installed in the new experiment pens and has been found very satisfactory. It is labour-saving, hygienic and overcomes the pollution factor associated with other methods where dry feeding is practised. Careful observation is necessary under heat-wave conditions as the water may become overheated, in which case an alternative water supply should be provided.

Vaccination Against Spirochaetosis.—An experiment is in progress to assess the value of vaccination of breeding stock in providing immunity to Spirochaetosis (tick fever) in chickens hatched from hens.

Meat Meal and Egg Quality.—This experiment showed that feeding a high percentage of meat meal did not affect keeping quality of eggs under cold storage conditions (see Poultry Experiment Bulletin No. 2).

Future Work.—Experiments planned include:—Use of limestone grit as a replacement for shell grit; toxicity of various weed seeds found in grain and weeds found in green crops; toxicity of natural waters containing different amounts of salts; palatability of the various varieties of grain sorghums.

Experiments under consideration include:—Economics of laying-houses and comparisons of different systems of housing; development of inbred and hybrid strains of poultry; further experiments on nutrition and hatchability.

List of Qualified Chick Sexers.

DURING the 1947 season four chick-sexing examinations were conducted by the Department and five candidates qualified for Certificates—two for Special Class and three for First Class.

The following is a list of holders of certificates issued by the Department, including those who qualified this season.

Special Class Certificates.

Mr. F. D. Evans, Leamington-street, Dundas.

Mr. S. W. Leach, Windsor-road, Baulkham Hills.

Mr. A. L. B. Newton, Blacktown.

Mr. N. B. Davies, Garnet-road, Miranda.

"RAILWAYS AT WORK"

The Department of Railways has issued a 48-page booklet with the title of "Railways at Work" to illustrate and describe a number of its interesting activities. This publication follows two others: "Railway Quiz", which contains answers to questions frequently asked about the Railways, and "Railways at War", which reveals the part played by the New South Wales Government Railways during the years 1939 to 1945.

This Department controls the largest industrial undertaking in the Commonwealth. A total of over £155,000,000 has been invested in its assets, which include 6,000 route miles of railway track, 700 stations and depots for the receipt and despatch of traffic, 1,150 locomotives, 3,000 passenger carriages, 26,000 freight vehicles, four electric power stations, and a number of large workshops for the construction and maintenance of plant and equipment. Approximately 56,000 men and women are employed by this huge public enterprise.

As a consequence, there is no shortage of interesting aspects of the railways at work. Actually, forty-five have been selected to give the reader an insight into the principal activities such as the handling of passenger and freight traffic, the operating of steam, electric and diesel trains, the building of rollingstock, permanent-way and bridges, the provision of signals, and the work undertaken in the laboratories, factories, workshops and offices.

S. R. NICHOLAS,
Secretary for Railways.

Mr. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. R. W. Druce, Old Prospect road, Wentworthville.

Mr. R. A. Percival, 135 Longueville-road, Lane Cove.

Mr. S. Martin, Duggan Farms, Blacktown.

Mrs. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. S. G. Olsson, Western-road, Wentworthville.

Miss B. B. Brown, Redleaf, Green's-avenue, Dundas.

Mr. J. Edwards, 74 Grantham-road, Seven Hills.

Mr. C. R. Sims, 5 Millar-street, Drummoyne.

Mr. H. D. Brown, Braeside-road, Wentworthville.

Mr. G. A. Lee, 60 Beaufort-street, Croydon Park.

Mr. R. G. Amies, Windemere-avenue, Northmead.

Mr. K. L. Moore, 5 Daisy-street, Chatswood.

Mr. B. J. Dawson, Withers-road, Kellyville.

Mr. A. Pamment, 75 Harris-street, Guildford.

First Class Certificates.

Mr. A. A. Tegel, Leppington.

Mr. C. R. Badman, Mackenzie-street, Revesby.

Mr. J. R. Kilborn, 9 Denman-street, Eastwood.

Mr. E. Marchant, Melbourne, Victoria.

Mr. W. Evans, Leamington-street, Dundas.

Mrs. F. D. Evans, Leamington-street, Dundas.

Mr. C. C. Green, 82 Carlingford-road, Epping.

Miss V. Wilson, Box 249 P.O., Newcastle.

Mr. H. Jacobs, Vimiera-road, Eastwood.

Mr. I. A. Hazlett, Ingleburn.

Mrs. A. Brakell, Church-street, Carlingford.

Mr. K. Gibson, Wensley House, Stamford Park road, Mt. Roskill, Auckland, New Zealand.

Mr. Gordon Thomson, Opoho, Dunedin, New Zealand.

Mr. A. E. Sutton, 65 Bungaree-road, Wentworthville.

Mr. J. H. Turner, Hotham-road, Sutherland.

Mrs. T. M. Brown, Main-road, Kearsley, via Cessnock.

Mr. J. Herrman, 86 Station-street, Fairfield.

Mr. H. Wallaste, Grantham-road, Plumpton.

Mr. O. Van Stappen, Pacific Highway, Wyong.

Mrs. H. M. Leach, Windsor-road, Baulkham Hills.

Mr. A. M. Smith, Richmond-road, Blacktown.

Mr. A. H. Baker, 13 Marion-street, Harris Park.

Mr. R. Pitt, Government-road, Weston.

Mr. O. Korting, Bid-a-wee Poultry Farm, Quaker's Hill.

Mr. R. O. J. Clucas, Excelsior-avenue, Castle Hill.

Mr. K. J. Fooks, Tomah-street, Carlingford.

Mrs. Z. Jacobs, Kildare-road, Doonside.

Mr. N. Long, Ferndell-street, Guildford.

Mr. R. Lockyear, Hurt-street, West Wollongong.

Mr. G. E. Mahon, Kings-road, Ingleburn.

Mr. R. J. Mayjor, 106 Ballandella-road, Toongabbie.

Mr. F. S. Wrigley, 1 Blencairn-avenue, Caulfield, S.E. 7, Melbourne.

Mr. R. Clark, Bay-road, Arcadia.

Mr. S. G. Gibson, Richmond-road, Marsden Park.

Mr. R. Watson, 4 West Terrace, Bankstown.

Mr. R. C. Parkin, 3 O'Neil-street, Granville.

Miss N. Nall, Herring-road, Eastwood.

Mr. D. Melville, c.o. Leach's Hatchery, Windsor-road, Baulkham Hills.

Second Class Certificate.

Mrs. W. J. Hanley, 219 Princes Highway, Charlestown.

Standards for Certificates.

Particulars of the standards for the various certificates are as follows:—

For a Special Class Certificate, it is necessary to sex 300 White Leghorn chickens in 45 minutes with 98 per cent. accuracy, without killing or injuring a chicken.

For a First Class Certificate, 200 White Leghorn chickens must be sexed in 30 minutes with an accuracy of 95 per cent., and not more than one chicken killed or two injured.

The Second Class Certificate, which has now been discontinued, was introduced as a wartime measure in order to enable more sexers to qualify to meet the increased demand. The standard was the same as for First Class except that 50 minutes were allowed for sexing the 200 chickens. Several candidates qualified for this certificate and later gained First Class Certificates.

The Position Regarding Sexers.

At the present time there are sufficient sexers to cope with most of the sexing in the main commercial poultry farming centres of this State, but some small farmers are still not able to obtain the services of sexers because of the small number of chickens handled and the distance apart of the farms.

The services of the Special Class Certificate holders are sought by hatcherymen and they obtain full employment; in addition there are persons holding First Class Certificates who have reached a higher standard, but have not yet attempted to qualify for a Special Class Certificate, and these are also fully employed. A few sexers have given up work outside of their own hatcheries.

In the event of larger numbers of chickens being hatched next season, as a result of increased feed supplies and the appeal for more eggs for Britain, there will be room for a few more sexers.

Facilities for Learning Chick Sexing.

If there are sufficient applicants, classes of instruction in chick sexing are usually held in the autumn by one of the leading sexers, who is sponsored by the Chick Sexers' Association. It should be realised, however, that in addition to attending classes, which extend over about three months, it is necessary to have intensive practice on some thousands of chickens before a candidate can expect to qualify for a certificate.

Good eyesight and deft fingers are essential to expertness in the art of chick sexing; thus youth is necessary for the highest efficiency. Few people over the age of 30 years when commencing have reached the highest standards, and many younger candidates have attended four to six examinations before qualifying.

It will, therefore, be seen that it is not easy to master the art of sexing—and the cost can be very considerable, especially if chickens have to be bought for practice.

POULTRY *farmers are reminded that applications for pens in the* 1948-49 *Egg-laying Competition to commence at Hawkesbury Agricultural College, Richmond, on* 31*st March,* 1948, *will close on* 11*th December,* 1947, *by which date the application form showing particulars of stock owned at* 1*st December,* 1947, *must be in the hands of the Organising Secretary, Hawkesbury Agricultural College, Richmond, N.S.W.*

Apiary Notes—*continued from page* 605.

Mr. A. I. Gillespie, Border Crossing Inspector, Killarney, Queensland.

Mr. G. Frankham, Riverton Crossing, Queensland.

District Veterinary Officer, Grafton.

Inspector of Stock, Casino.

Inspector of Stock, Lismore.

Inspector of Stock, Grafton.

Inspector of Stock, Inverell.

Inspector of Stock, Glen Innes.

"SCALY LEG" IN POULTRY.

N. B. KING, B.V.Sc., Veterinary Officer.

SCALY LEG is a chronic disease affecting the legs and feet of fowls, turkeys and cage birds. It is caused by the activities of a microscopic mite *Cnemidocoptes mutans*, which tunnels into the surface layers of the skin underneath the scales, causing a chronic inflammation which produces scabs and crusts under the scales. Older birds appear more susceptible than younger ones. Predisposing causes are unhygienic conditions, running birds of all ages together, and overcrowding.

Symptoms.

The mites damage the surface skin layers, causing the exudation of serum. This solidifies and forms crusts and scabs of a greyish, powdery consistency, which force the leg scales apart. The legs assume a ragged, rough appearance, particularly the posterior surface.

The crusts and scabs can be removed in the early stages, but in advanced cases, bony abnormalities occur which interfere with the mechanical processes of tendons and ligaments; consequently lameness is frequently seen. Badly affected birds show a drop in production, become weak and may even succumb. Itchiness is present and is more pronounced at night or in warm weather when mites are more active.

Rarely the mites affect the comb, wattles and neck.

Spread of Infection.

Transmission to uninfected birds progresses slowly by contact with infected birds and with infected surroundings. Mites present in scales and crusts which fall off, contaminate yards and pens. It is readily seen that the rate of spread will depend on the hygiene exercised in the yards, and the amount of contacts affected birds have with clean birds.

Treatment.

The first essential is to isolate or cull affected birds.

Individual treatment is the only effective method. It consists of the application every three or four days of some oily compound which will penetrate the skin and suffocate the mites.

For treatment to be effective it is necessary to remove as many scales and crusts as possible to enable the medicaments to penetrate. First soak the shanks in warm, soapy water, and scrub the affected areas with a nail or toothbrush. Then apply one of the following:—

1. Phenol disinfectant, 1 tablespoon to 1 pint of water. May also be applied to the comb, wattles and neck.
2. Kerosene and crude oil (sump oil) equal parts. Shanks should be dipped, using a deep tin.
3. Kerosene emulsion (1 lb. soft soap, 1 gallon kerosene, 2½ gallons of water).
4. Kerosene 1 part, linseed oil 2 parts. Do not apply to feathered portions of body.

Prevention of Re-infestation.

Immediately infection is noticed the yards should be thoroughly cleaned out, litter burned and yards dug over. The houses

A Bad Case of Scaly Leg.

(*Continued on page* 616.)

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Cocks, F. D., " Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., " Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, " Strathfield," Walla Walla.
Nemingba State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., " Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road Holgate, via Gosford
Wagga Experiment Farm, Wagga.
Walker, J. R., " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp. Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., " Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., " Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	48
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., " Meryla," Culcairn	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., " Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, " Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jesreys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Short-horns)	102
Raper, W. R., Calool, Culcairn	80
Reid, D. P., " Evandale," Sutton Forest (Aberdeen-Angus)	24
Reid, G. T., " Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., " Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., " Mourabie," Quirindi (Jerseys) ...	58
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., " Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. " Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, " Abington," Armidale ...	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	259	20/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook	93	15/8/47
Riverina Welfare Farm, Yanco (Jerseys)	91	14/10/48
Rowntree, E. S., "Mourable," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	167	21/2/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	119	20/4/48
Yanco Agricultural High School, Yanco	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	49	14/4/48
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus	209	12/8/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ehsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N. L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell	111	9/9/48
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	57	2/11/47
MacNamara, B., "Mount View," Cessnock	58	16/5/48
Marist Bros. College, Campbelltown	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville	21	8/8/46
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital	24	2/9/47
St. Ignatius' College, Riverview	27	14/8/48
St. John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree	53	10/2/48
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Wallaga Lake Aboriginal Station	19	29/4/47
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	87	8/10/47
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	94	8/10/47
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	66	8/10/48
William Thompson, Masonic School, Baulkham Hills	52	10/6/48
Wilson, A. G., Pty., Ltd., "Blytheswood," Exeter	65	26/3/49
Youth Welfare Association of Australia	171	14/4/49

Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Another 1,000 lb. Cow.

"Alne Bank Buttercup 43rd."

THE Minister for Agriculture, Hon. E. H. Graham, has announced that "Alne Bank Buttercup 43rd," an Australian Illawarra Shorthorn cow, aged 9 years and 3 months, owned by Mr. G. E. Chittick, "Alne Bank," Gerringong, recently completed a 365 days' record from which she yielded over 1,000 lb. of commercial butter.

The figures were 20,947½ lb. milk, 3.9 per cent. average test, 826.8 lb. butterfat, equal to 1,008.3 lb. commercial butter.

These figures were established under the rules of Division 1 (official section) of the Herd Production Improvement Scheme administered by the New South Wales Department of Agriculture.

"Alne Bank Buttercup 43rd" is the third cow in the Illawarra District and the twentieth Australian Illawarra Shorthorn cow in this State to exceed 1,000 lb. of butter in twelve months. This occasion is the twenty-fifth on which Australian Illawarra Shorthorn cows have performed the feat of exceeding 1,000 lb. of butter in 365 days.

Production for the one period of sixty days, nine periods of thirty days and one period of thirty-five days was as follows:—

Month.	Milk lb.	Butterfat lb.
August, 1946	5010	171.36
September	2340	79.44
October	2475	91.80
November	1935	79.92
December	1822.5	75.66
January, 1947	1860	75.33
February	1710	75.81
March	1275	58.20
April	1020	48.24
May	765	38.31
June	735	32.73
	20947.5	826.80

"Alne Bank Buttercup 43rd" (28791 A.I.S.H.B.) was sired by "Alne Bank Victory" (1768), whose dam, "Beauty 2nd of Alne Bank," has a record of 409.3 lb. of butterfat in 273 days. Her dam was "Alne Bank Buttercup 23rd" (1065).

This animal, owned and registered by Mr. Chittick, was reared as a Junior Farmer Calf by G. A. Chittick, who also had the entire care and feeding of the animal during her recent outstanding performance.

Supply of Sugar for Spraying.

REFERRING to the fact that a number of orchardists and others have approached his Department in regard to the supply of sugar for spraying purposes, the Minister for Agriculture, Mr. Graham, stated:

"As rationing has now ceased, it is not necessary to obtain a certificate from a departmental officer. Persons requiring sugar for spraying should apply to the vendor from whom they usually obtain their supplies. If the vendor will make these requirements known to the wholesaler, the Colonial Sugar Refining Co. Ltd. will arrange to make supplies available. Obviously, growers should take these steps as early as possible."

"Scaly Leg" in Poultry—*continued from page 613.*

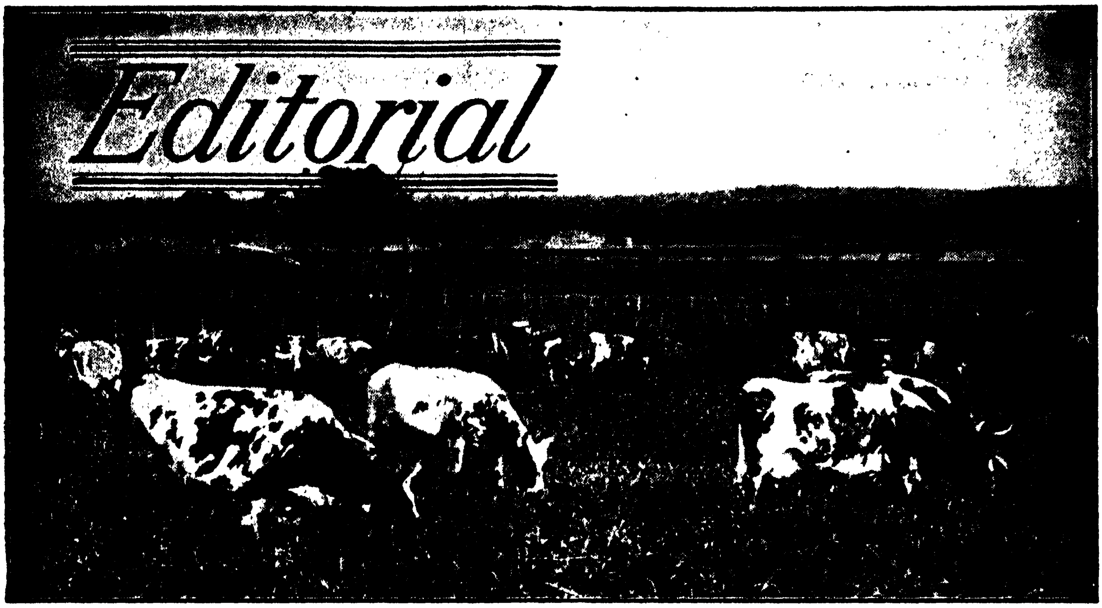
should be sprayed with 2 per cent. cresol disinfectant or wood preserving oil, using a pressure stirrup pump. Much of the success in preventing re-infestation will depend on the effectiveness of this disinfection and the diligence with which affected birds are treated.

If possible the yards should be spelled for six to eight weeks, during which time mites in scales will have succumbed.

All introduced birds should be carefully inspected before placing them with the flock. As a precaution, a routine treatment of all introduced birds can be carried out.

THE AGRICULTURAL GAZETTE FOR DECEMBER, 1947.

This Issue Contains:—



Food for Britain.

Drive by Minister.

TWICE within a decade this country has been called upon for an all-out food production effort—first to help win the war, now to help win the peace.

Australia's magnificent achievement on the wartime food front, in spite of discouraging difficulties, won the admiration of the world. Unfortunately, though not unexpectedly, hunger now stalks a large section of the world; in particular, Britain. There is no greater enemy of peace than hunger.

The Minister for Agriculture (Hon. E. H. Graham, M.L.A.) recently launched an appeal for increased food production. Conferences have been held in Sydney, Kempsey, Newcastle and Lismore, at each of which the Minister has directed his appeal to all sections of the community, though primarily to farmers.

There can be no doubt as to the urgent need to provide more food for people in Britain. Stated very baldly, the fact is that human beings (men, women and children) in Britain are making a valiant attempt to subsist on a weekly allotment of food which many a hearty Australian eater could consume at a single meal.

The meagreness and monotonous nature of Britain's ration must be physically distressing to men and women still expected to labour hard to rehabilitate their war-torn homeland. It must be doubly distressing to the millions of parents in Britain to note the imploring looks on the faces of their children, whose appetites are far from satisfied at any meal.

That is stating the facts bluntly, and perhaps unpalatably, but that is how it is in Britain to-day.

Farmers attending these regional conferences have unanimously and readily supported the Minister's appeal for an immediate and sustained food production drive. That is not possible, however, without full support by all sections of the community, and especially by the secondary industries.

Production in all sections of primary industry and in all districts of the State is severely hampered by shortages of materials and equipment. Greater output of such essentials as farm machinery, spare parts electric motors, galvanised iron, plain and barbed wire, wire netting and the like is essential to maximum food production. Thus a big responsibility in placed on the major secondary industries to do their part to assist in this food production drive.

Given anything like an adequate supply of those items now in short supply, and with reasonable safeguards to prevent their entering black market channels, primary producers can be depended upon to help relieve, in quick time, Britain's present desperate food position.

Bags for Certified Seed Wheat.

Appeal to Metropolitan Householders.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has made a special urgent appeal to all people in the metropolitan area to forward any sound 3-bushel bags in the home to their local municipal or shire councils, which have agreed to receive them pending delivery to the Department for distribution.

These bags are to be used by the Department of Agriculture for bagging certified pure seed wheat for next season's sowing. Growers with areas under new rust-resistant varieties have not sufficient bags to conserve the seed. As a result, there is a possibility that a large amount will be delivered to silos as bulk wheat and lost as seed.

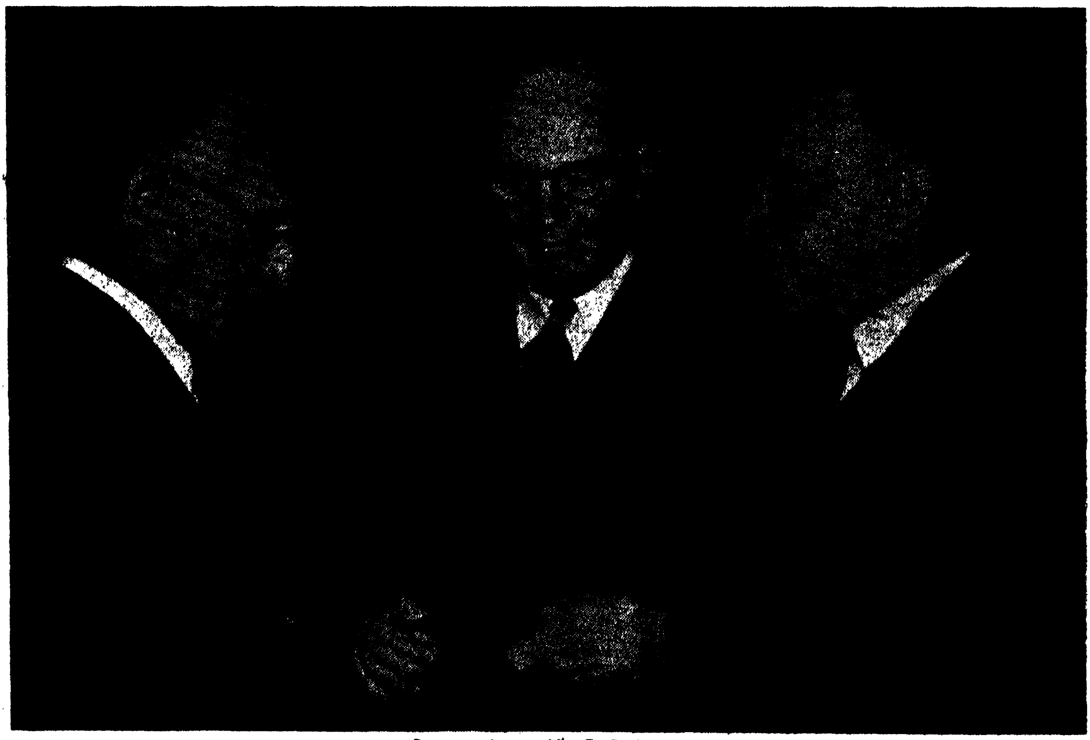
Retirement of Mr. C. C. Crane

Chief Division of Information and Extension Services.

MR. C. C. CRANE, B.A., who recently retired from the position of Chief, Division of Information and Extension Services of the Department of Agriculture, was farewelled by officers of the Department on 18th November.

Making a presentation on behalf of the staff of the Department, Hon. E. H. Graham, M.L.A., Minister for Agriculture, referred to Mr. Crane's long service to the State—nearly forty-nine years—and in particular to his work as Organiser of the Agricultural Bureau. Mr. Crane's extensive knowledge of farmers and their problems had specially fitted him for the post of N.S.W. Executive Officer, War Agricultural Committees, an office which he had filled with distinction during the war years.

Mr. A. W. Hicks (a member of the Public Service Board), Mr. R. J. Noble (Under Secretary and Director of the Department), and several Divisional Chiefs expressed their appreciation of Mr. Crane's services to the Department, particular mention being made of the development of extension schools which had proved of great value to field officers of the Department.



Presentation to Mr. C. C. Crane.

On Left—Mr. Crane; *Centre*, Dr. R. J. Noble, Under Secretary and Director; *Right*, Hon. E. H. Graham, Minister for Agriculture.

A FARMERS' BACONER COMPETITION

Is an Asset to Any Show.

SUCCESSFUL CONTEST AT LISMORE.

N. A. STEEL, H.D.A., Livestock Officer (Pigs).

THE Farmers' Baconer Competition introduced to the schedule of the North Coast National A. and I. Society's Show held at Lismore in October last was designed to overcome the shortcomings of the so-called "commercial" pig classes usually provided at country shows. It was given good support by local stockowners and proved of considerable interest, not only to the competitors but to pig breeders generally, as well as members of the public.

As a means of extending to country shows the educational value of the display of winning entries of pig carcases, at present only available in halls at Royal Shows, the competition has much to commend it. Show societies and producers in other districts will be interested in the methods by which the competition was organised and judged at Lismore, and in the suggestions which the author makes for inclusion of such a contest in the show schedules of other country agricultural societies.

While the exhibition of animals at agricultural and livestock shows for many years past has done much to assist breeders of pedigree animals to build up type and quality, and has increased standardisation within breeds, the purpose for which an animal is bred is sometimes lost in the desire to foster characteristics which have little bearing on the actual commercial value of the stock.

All show societies should, where possible, endeavour to include in their schedules, classes in which breeders may compete to demonstrate the commercial qualities of their stock.

For many years show societies have included sections in which pig-raisers are able to exhibit their breeding stock and other pigs, and in recent years the exhibition of bacon and pork pigs has also been possible; but methods of judging these "commercial classes," as they are usually termed, vary; that is, they may be judged alive or in carcase form, or both.

Where the pig is judged alive, the judge is forced to anticipate how the pigs would appear in carcase form, and how closely their carcases would conform to his idea of trade requirements. In such a task, the judge must do some guess-work, and in many instances, the exhibitor has been dissatisfied with the awards.

In some cases the commercial classes have been designed so that judging includes the judging of the carcase of one pig from each pen as well as the live judging of the whole pen. Here again, the factor of individual opinion arises, and the results have at times been misleading.

During recent years the introduction of the "Carcase Appraisal System" has provided a means of eliminating the personal factor or opinion in the judgment of pork and bacon carcases, and it has been used successfully at all Royal shows, where, with refrigeration available, the prize winning carcases have been put on display in meat halls. In this way, the full educational value of the commercial classes can be gained. Generally speaking, however, breeders do not appear to support these classes. It is the opinion of many that the main objection held by breeders is that the classes invariably call for a "Pen of three pigs"—and breeders cannot afford to have three high quality pigs slaughtered. From an educational point of view, this is a short-sighted policy, but on the other hand, when there is a heavy demand for breeding stock with high prices offering, there is certainly some substance in the argument.

Country shows have no refrigeration facilities, and while some have adopted the "Carcase Appraisal System" as a means of judging their "commercial classes," they have found it impracticable to display any

of the carcases after judging. Hence such classes lose much, if not most of their educational value, and the list of awards means little to the exhibitors, and nothing to the public.

The Lismore Competition.

A new class, "Farmers' Baconer Competition," introduced to the schedule of the North Coast National A. & I. Society's show held in Lismore in October, 1947, was designed to overcome the shortcomings of pig competitions or classes previously scheduled; it met with good support and much interest. Twenty entries were received from both stud and commercial pig-raisers; they included Berkshire, Tamworth, Large White and Wessex Saddleback pigs, as pure breds, as well as many crosses.

In this competition, pig-raisers were asked to submit only one pig—sired by a pure-bred boar—to yield a carcase within the weight range of 130-170 lb. In this way, a pig-raiser competitor became his own judge, and naturally selected what he considered his best baconer. The pig selected had to be delivered to the bacon factory by a given date. There it was slaughtered and its carcase was put through the normal curing processes. At show-time it was appraised in the form of a side of bacon, on conformation and its suitability to modern trade requirements in accordance with the points set out in the schedule. Processing, flavour, smoking, trimming, etc., were not taken into account.

The conditions of entry, scale of points for judging and the points awarded the prize winners in this competition are shown below:—

Conditions.

1. Each exhibit shall be—
   (a) Bred and finished by exhibitor.
   (b) Sired by a pure-bred boar. The breeding of each exhibit, together with date of birth and method of feeding, must be shown on entry forms. A declaration must also be made on the entry form certifying that these particulars are correct.
2. Delivery of pigs must be made to either Foley Bros. factory, Lismore, or Norco Works, Byron Bay, on or before Wednesday, 20th August.
3. All exhibits to be clearly branded on each side near the shoulder, and Factory Managers to be advised that the pig is for exhibition in this class.

   N.B.—Points will be deducted for bad branding.
4. All exhibits will be weighed in accordance with the usual factory practice. A margin of 5 lb. either under or over the specified weights will be allowed.

The Factories concerned will purchase the pigs at ruling factory prices and they will become the property of the respective Factory.

The sides of bacon will be displayed in the Dairy Produce Section in the Pavilion for the duration of the Show.

Scale of Points for Judging.	*Marks.*
(1) Marketing Points:	
Colour—clean and fresh	10
Skin—smooth and fine, free from disfigurement	
(2) Breeder's Points:	
(a) By Inspection:	
Hams—well filled and fine boned...	8
Shoulders—light	7
Streak—thick, full of lean meat....	12
(b) By Measurement:	
"Eye muscle" of loin—thick	28
Back fat thickness—correct proportion	20
Body length—in proportion to weight	20
Depth and balance of side	5
Total marks	110

Prize Winners.

	First Prize. (P. J. Scheibel and son, Goolmangar.)	Second Prize. (A. N. Cox, Byrrill Creek.)	Third Prize. (J. A. Johnson, Eureka.)
Details of Entry—			
Breed or Cross.	Berkshire.	Large White.	Tamworth-Tamworth X Berkshire.
Age in Months	6	7	6½
Carcase Weight	140 lb.	160 lb.	148 lb.
Points Awarded—			
Skin and colour (Max. 10)	8	8½	9
Hams (Max. 8)	8	7½	7
Shoulders (Max. 7) ...	5½	6½	6
Streak (Max. 12)	8½	6½	9
Eye Muscle (Max. 24) ...	11	13	18
Back Fat (Max. 20) ...	19	18	17
Body Length (Max. 20) ...	18	15	17
Depth and Balance of Side (Max. 5)	3½	1¾	½
Total (Max. 110) ...	81½	76¾	73½

By judging the class in the form of cured bacon, the difficulty of providing refrigeration otherwise necessary for display purposes was overcome, and a full display was staged in the Dairy Produce Pavilion. Each entry was ticketed with the points allotted and full educational value of the competition was available to all who viewed the sides.

The competition provided breeders with the opportunity of completing the exhibition of their pigs. In the Pig Section, they were able to show their breeding stock and its progeny, while by means of an entry in the

Farmers' Baconer Competition displayed in the Pavilion, a means was provided of demonstrating the commercial qualities of their pigs in the form of the finished product as bought by the consumer. In addition to this, each exhibitor was able to see just how correct his judgment was when selecting the pig that he thought was an ideal baconer.

A Suggestion for Other Show Societies.

The success which the North Coast A. & I. Society achieved with the Farmers' Baconer Competition may be had by any other society which can introduce a similar competition. In order that consideration may be given to its inclusion in a schedule, the methods of organising and judging such a baconer competition, including an explanation of the scale of points, are given below in some detail.* These should be carefully studied before a decision is made.

Arrangements with Bacon Factory.

Full co-operation must be had with the bacon factory selected to handle the carcases. As bacon curing necessitates up to two months' processing, the date of receipt of entries at the factory has to be fixed well beforehand. If possible, arrangements should be made with the factory to buy the carcases at ruling factory prices, in which case the cured bacon would be the property of the factory. Failing this, some other satisfactory arrangement may be made. The factory should be asked to keep a list of the "chilled carcase weight" and the identification marks of each carcase. The factory should also be asked to leave the first rib and aitch bone intact, when dressing the side for curing. The chilled carcase weight, and the first rib and aitch bone are most important in the appraisal work. The date of delivery of the sides of bacon to the showground must also be fixed to allow ample time for classing and appraisal.

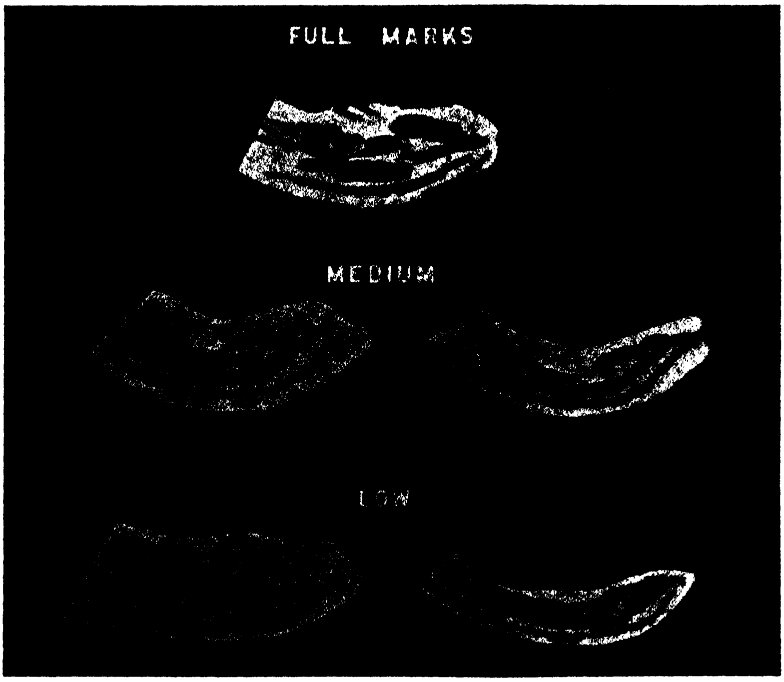


Fig. 1.—Standard for Award of Marks by Eye Appraisal. (Bacon.)

Showground Requirements.

For appraisal work, a rail with suitable hooks, and a table are necessary. The rail can be provided quite easily by means of a 4 inch x 2 inch hardwood or galvanised piping, to which hooks are attached. About 15 inches of rail space should be allowed to each side. This rail could also be used for display work.

Other requirements are a sharp butcher's knife, butcher's steel, steel tape measure

*The scale of points suggested has been adapted from the Hammond method of carcase appraisal and the New Zealand system of baconer judging, and in this explanation both have been drawn upon freely for tables, illustrations and narrative.

graduated in millimetres, and fine-pointed callipers or dividers, but possibly these may brought along by the judge if requested to do so.

Display of the Sides.

Refrigeration is not required for cured bacon, but protection from flies is necessary. This can be provided by wrapping all pieces of bacon in clear cellophane, which should be sealed with glue when wrapping is completed. Incidentally, cellophane adds to the display.

Tickets showing the appraisement should be provided. Cards 8 inches x 10 inches in size would be suitable. Each card should show breed, carcase weight, age, and be sectioned off according to the points. Also, the exhibit number and exhibitor's name should be shown.

In the appraisal work, each side must be cut at the loin and the opportunity should be taken to cut a rasher from the rear end. This rasher may be placed near the side from which it came, or on a board with the other rashers. In the latter case, it would be necessary to number each rasher with the exhibit number so that each exhibitor and members of the public can readily identify the side from which each rasher came. The display of rashers is to be encouraged, as it is from the rasher that the consumer makes his judgment.

When displaying the sides, if it is desired to hang them, the two pieces may be sewn together with a "stringer" and wrapped in cellophane when hung. It would be an advantage to hang the five or six sides gaining most points, if not all.

Method of Judging.

All sides of bacon should be hung for judging with their exhibit numbers and carcase weights ticketed on them. The judge should be given a note-book in which to make his comments, and appraisal should be carried out in the following order:—

(1) Marketing points.
(2) Hams.
(3) Body length.
(4) Shoulders and fore-end.
(5) Balance and depth of side.

The sides should then be placed on the table and depth of chest measured. After this, the side should be cut through level with the last rib, and the cut on the forward end exposed for eye muscle and back fat measurement and appraisal of the streak in the belly. When appraisal has been completed, the rasher, as suggested above, may be removed and the side fixed for display.

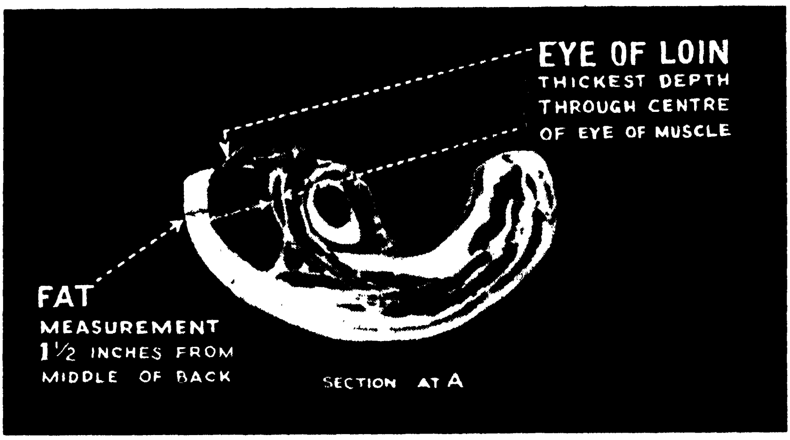


Fig. 2.—Section showing Positions for Measurements for Eye Muscles and Back Fat.

The Scale of Points Explained.*

	Points.
1. Marketing Points.	
Colour.—Free of pigmentation. *Skin.*—Smooth, fine, free from bruises. Severe branding or disfigurement due to bad branding or badly placed brands should be penalised.	5
2. Breeders Points.	
BY INSPECTION :—	
Ham.—Must be thick through the thigh at tail level, and deep to the stifle when viewed from the side; well filled inside the leg, carrying the maximum development of flesh to the hock.	8

* The scale of points discussed here differs slightly in points allotted under two headings from that used by the North Coast National A. and I. Society.

Making Forests

as well as Hardboards

ABOVE.—After the tree seeds have sprouted in seed beds, they are replanted in collapsible steel tubes. Six weeks later they are planted in the forest in their permanent positions.

THE conservation of Australia's timber resources is vital to the national economy. No undertaking is more conscious of its responsibility in this regard than the Masonite Corporation, manufacturers of hardboards which are fabricated entirely from timber. How can an undertaking, whose sole raw material is timber, help to conserve forests? The answer is twofold. In the first place, *Masonite is made from timbers which have no other commercial value whatsoever. Secondly, the manufacturers of Masonite plant two trees for every one they cut. Last year 18,000 tree seedlings were planted. The number will be greatly increasd from year to year.*

The manufacturers of Masonite, therefore, not only make Australia's strongest and most versatile building board; *they are helping to make Australia's finest forests as well.*

MASONITE THE WONDER BOARD OF 1000 USES

MASONITE CORPORATION (AUSTRALIA) LIMITED

SALES AND SERVICE DIVISION:

369 PITT STREET, SYDNEY; 533 COLLINS STREET, MELBOURNE; 337 QUEEN STREET, BRISBANE; 31 CHESSER STREET, ADELAIDE.

MA39F-47

Points.

Shoulder and Fore-end.—Light in proportion to rest of carcase. Neck and jowl should be light; the shoulder not too deep when viewed from the side, nor too thick through. A lightly-fleshed shoulder should be penalised. — 7

Streak.—Not only should belly be thick, but it should contain a high proportion of lean meat. Full marks are given to a streak which is both thick and full of lean meat properly balanced with fat. Minimum marks (1) for one which is too thin or which is thick, but contains a high proportion of fat. Intermediate marks, 6. — 12

BY MEASUREMENT :—

"*Eye Muscle*" *of Loin.*—The thickness is measured half-way along its width (see Fig. 2). This gives the the best measure of the thickness of lean meat throughout the carcase. Carcases vary much more in the thickness than in the width of the muscle, so the thickness has been selected as the index of lean meat to be found in the carcase. The scale for converting measurements to marks is given in Table I. — 28

TABLE I.—MARKS FOR THICKNESS OF EYE MUSCLE OF LOIN.

Marks.	Carcase weight (lb.).					
	100 to 109	110 to 119	120 to 139	140 to 159	160 to 179	180 to 189
	Thickness of Eye Muscle (mm.).					
1	30	31	32	33	34	35
3	31	32	33	34	35	36
5	32	33	34	35	36	37
7	33	34	35	36	37	38
9	34	35	36	37	38	39
11	35	36	37	38	39	40
13	36	37	38	39	40	41
14	37	38	39	40	41	42
15	38	39	40	41	42	43
16	39	40	41	42	43	44
17	40	41	42	43	44	45
18	41	42	43	44	45	46
19	42	43	44	45	46	47
20	43	44	45	46	47	48
21	44	45	46	47	48	49
22	45	46	47	48	49	50
23	46	47	48	49	50	51
24	47	48	49	50	51	52
25	48	49	50	51	52	53
26	49	50	51	52	53	54
27	50	51	52	53	54	55
28	51	52	53	54	55	56

Back Fat Thickness.—For baconers this is measured $1\frac{1}{2}$ inches from the middle line, with one point of callipers at the edge of the "eye muscle" and the other just on the inner layer of the skin (see Fig. 2). This gives a better measure of the amount of fat in the carcase than does the measurement of the fat at the shoulder, for it is the last part of the back fat to develop.

Fat differs from all other points for marking, inasmuch as for each weight group of carcase there is an optimum requirement of back fat; there can be too little as well as too much. Consequently, the scale for converting measurements to marks (Table II), unlike the others, is extended on both sides of the optimum.

At one time the measurement of the thickness of the back fat from the point of the "eye muscle" farthest from the backbone to the skin was considered as it is here that the thickness of fat shows up in the cut. Agreement was good when all measurements were taken by one person, but not when they were taken by different persons, for it is more difficult to judge the exact point at which the measurement should be taken here than in the place now adopted.

TABLE II.—MARKS FOR THICKNESS OF FAT OVER LOIN. Measurements in mms.

Marks.	Carcase weight (lb.).									
	100 to 109	110 to 119	120 to 129	130 to 139	140 to 149	150 to 159	160 to 169	170 to 179	180 to 189	190 to 199
	Thickness of Fat over Loin (mm.)									
1	4	5	7	8	9	10	11	12	13	14
4	5	6	8	9	10	11	12	13	14	15
7	6	7	9	10	11	12	13	14	15	16
10	7	8	10	11	12	13	14	15	16	17
12	8	9	11	12	13	14	15	16	17	18
14	9	10	12	13	14	15	16	17	18	19
15	...	...	...	14	15	16	17	18	19	20
16	10	11	13	15	16	17	18	19	20	21
17	...	...	14	16	17	18	19	20	21	22
18	11	12	15	17	18	19	20	21	22	23
19	12	13	16	18	19	20	21	22	23	24
20	13	14	17	19	20	21	22	23	24	25
19	14	15	18	20	21	22	23	24	25	26
18	15	16	19	21	22	23	24	25	26	27
17	...	...	20	22	23	24	25	26	27	28
16	16	17	21	23	24	25	26	27	28	29
14	17	18	22	24	25	26	27	28	29	30
12	18	19	23	25	26	27	28	29	30	31
10	19	20	24	26	27	28	29	30	31	32
7	20	21	25	27	28	29	30	31	32	33
4	21	22	26	28	29	30	31	32	33	34
1	22	23	27	29	30	31	32	33	34	35

Points.

Body Length.—This is measured with a tape measure from the edge of the symphysis pubis bone to the junction of the sternum with the first rib (see Fig. 3). It gives a measure of the length of the valuable loin joint which can be cut off the carcase. A high proportion of this to the weight of the carcase as a whole increases the value of the carcase for cutting purposes. The scale for converting measurements into marks is given in Table III. — 20

TABLE III.—MARKS FOR BODY LENGTH (SYMPHYSIS PUBIS TO FIRST RIB).

Marks.	Carcase Weight (lb.).																			
	100 to 104	105 to 109	110 to 114	115 to 119	120 to 124	125 to 129	130 to 134	135 to 139	140 to 144	145 to 149	150 to 154	155 to 159	160 to 164	165 to 169	170 to 174	175 to 179	180 to 184	185 to 189	190 to 194	195 to 199
	Body Length (mm.).																			
1	630	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820
2	635	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825
3	640	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830
4	645	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835
5	650	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840
6	655	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845
7	660	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850
8	665	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855
9	670	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860
10	675	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865
11	680	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870
12	685	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875
13	690	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880
14	695	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885
15	700	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890
16	705	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895
17	710	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900
18	715	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905
19	720	730	740	750	760	770	780	790	800	810	820	830	840	850	860	870	880	890	900	910
20	725	735	745	755	765	775	785	795	805	815	825	835	845	855	865	875	885	895	905	915

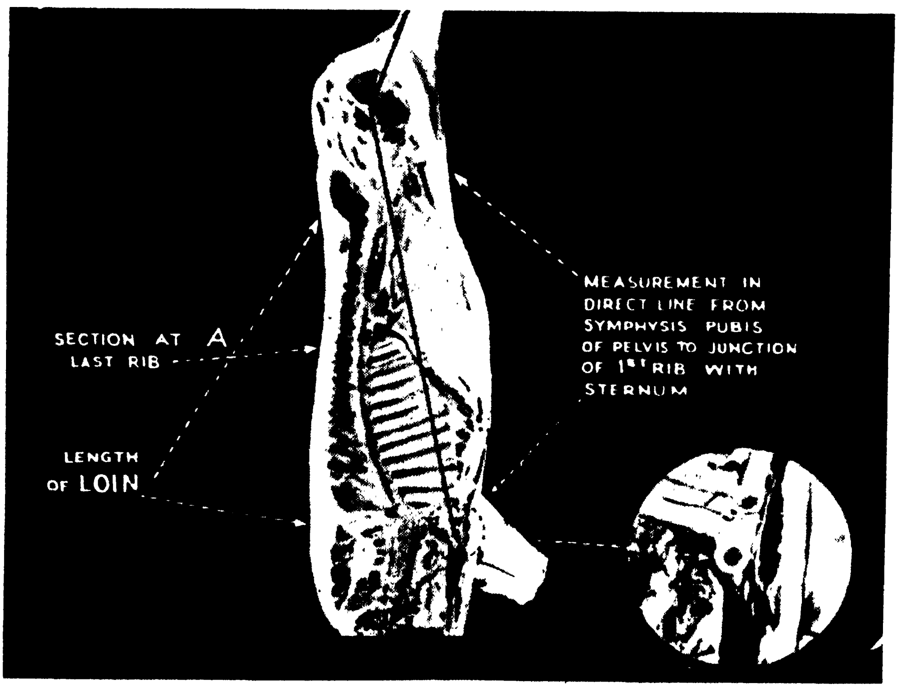


Fig. 3.—Side showing Positions for Body Length Measurements.

Points.

Balance and Depth of Side.—A good side is one which is not only well balanced in its proportions, but also one which is not too deep at the fore-end. Depth of a side should be considered in relation to its length. Accordingly the carcase is measured through the deepest part of the chest and points awarded according to the ratio of this measurement to the length. For maximum points 10

the chest depth must not be more than 40 per cent. of the length. To discourage the breeding of pigs too shallow in the chest, a penalty of 2½ points should be deducted from the score for this character in the case of pigs that measure 25 or more millimetres below the minimum chest depth standard for full points.

To measure the depth of chest, lay the side flat on the table so that its back line is level with the table's edge. The measurement through the chest may then be marked on the table, and when the side has been removed, the measurement taken off with the steel tape measure, and converted to points according to Table IV.

TABLE IV.—MARKS FOR BALANCE AND DEPTH OF SIDE.

Marks.	Length of Side in Millimetres.								
	625 to 649	650 to 674	675 to 699	700 to 724	725 to 749	750 to 775	776 to 799	800 to 824	825 to 849
	Depth of Side (mm.).								
1	309	319	328	337	347	356	365	375	384
2	303	313	322	331	341	350	359	369	378
3	297	306	315	325	334	344	353	363	372
4	290	300	309	319	328	337	347	356	365
5	284	294	303	313	322	331	341	350	359
6	278	288	297	306	315	325	334	344	353
7	273	282	290	300	309	319	328	337	347
8	265	275	284	294	303	313	322	331	341
9	259	269	278	288	297	306	315	325	338
10	253	263	273	282	290	300	309	319	328

NOTE.—½ points should be allotted for measurements between the above, *e.g.*, length 625 mm.; depth 306 mm. would gain 1½ points.

Progressive Farmer Competition.

Finalists to Face Judges.

THE State Judges of the New South Wales Rural Bank Progressive Farmer Competition have narrowed their choice of regional representatives to ten.

These ten farmers are to be interviewed by the Judges in Sydney on Wednesday, 17th December.

Each candidate will be required to broadcast a short address and record an impromptu radio interview on some rural subject.

Meanwhile, a special inspection committee is visiting finalists' properties. A full report on the methods and achievements of these progressive farmers will be made to the judges.

The finalists who will visit Sydney are as follows:—

Mixed Farmers (Wool and Wheat).—J. C. Garran, Canberra; J. D. McClintock, Cootamundra; W. A. Meares, Forbes.

Dairy Farmers.—M. R. Buttsworth, Hannam Vale, via Taree; H. O. Cox, Kangaroo Valley; I. L. Robinson, Coraki.

Specialists.—E. C. Armstrong, Raymond Terrace (Citrus Fruits and Vegetable); S. J. Braithwaite, Griffith (Citrus Fruits); W. H. Bruce, Castle Hill (Poultry); J. Sedgwick, Batlow (Stone Fruits).

The winner in each section will be awarded a six-months-expense-free tour of the United States, Canada and the United Kingdom, leaving Sydney in March next. Whilst abroad, they will study the latest developments in crop and livestock production and in marketing methods.

Short Refresher Courses in Farm Management.

For Ex-servicemen.

THE second of the short refresher courses for ex-servicemen concluded at Wagga Experiment Farm on 14th November, and was even more successful than the first. The keenness of the trainees has been a feature of each of these courses.

Much of the original syllabus has been revised in the light of experience and many practical suggestions made by trainees have now been embodied. The scope of the course includes elementary veterinary science; animal production; drought feeding; first aid to animals; elementary agricultural economics, including planning and farm record keeping; crops and pastures; soils; fertilisers; fodder conservation; soil conservation and water conservation. In addition, the experts who attend the course advise on all the problems facing the present-day farmer.

Full use is made of visual aids to education and much instruction is given by means of films, slides and demonstrations. Many firms and individuals have helped by lending most interesting agricultural films.

A few vacancies exist for No. 3 and No. 4 Courses, starting at Yanco on 2nd February, 1948, and 5th April, 1948, respectively.

Other courses are to be held as follow:—No. 5 Course, on 7th June, 1948, at Yanco; No. 6 Course on 9th August, 1948, at Yanco.

Application should be made to the Deputy Co-ordinator of Rural Training, Department of Agriculture, Box 36A, G.P.O., Sydney

Departmental Appointments.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) has announced a number of departmental appointments:—

New Chief, Division of Information and Extension Services.

Mr. H. Parry Brown, B.A., B.Sc.Agr., has been appointed Acting Chief of the Division of Information and Extension Services, following the retirement of the Chief of that Division, Mr. C. C. Crane.

Mr. Brown entered the Department as a University trainee in Agricultural Science in March, 1920. Following his graduation as B.Sc.Agr. in 1933, he was appointed to the Biological Branch as Plant Pathologist, serving in that capacity for approximately nine years. In 1941 he graduated as B.A.

Since early in 1942, Mr. Brown has been attached to the Division of Information and Extension Services as Organiser of the Agricultural Bureau. In that capacity he has had considerable experience in administrative and organising duties, and in connection with the information services of the Department. During the war period he assisted the Executive Officer of the New South Wales War Agricultural Committees in the organising of these bodies and in executing through them the war-time plans and controls associated with primary production.

During his departmental career, Mr. Brown has been actively associated with various scientific and primary producer organisations. He is a past president of the N.S.W. Branch of the Australian Institute of Agricultural Science, and president of the Sydney University Agricultural Graduates' Association.

Supervisor of Experiment Farms.

Mr. Leonard Judd, Executive Officer of the Farm Mechanisation Scheme in the New South Wales Department of Agriculture, has also been appointed supervisor of Experiment Farms.

Mr. Judd's appointment, said the Minister, would help expedite his plans for a thorough re-organisation of the Department's Experiment Farms. His aim, said Mr. Graham, was to bring all these farms to such a standard of efficiency that not only would they serve as model farms for the guidance of primary producers in the districts in which they were situated, but would also serve as centres for dissemination of knowledge of advanced farming methods and scientific data for the general improvement of farming practices.

Mr. Judd had had wide experience as an agricultural officer since he had joined the Department of Agriculture in 1913. He was Farm Manager at Hawkesbury Agricultural College for five years, and Manager of Temora Experiment Farm for eight years. As a District Agronomist he had served in various parts of the State. In 1944 he was appointed Executive Officer of the New South Wales Farm Mechanisation Scheme.

Farm Managers.

Arrangements had been made to appoint permanent Managers to a number of Experiment Farms where experimental and research work has for some time been under temporary supervision. The following appointments have been announced:—

Trangie Experiment Farm.—Mr. E. S. May, Livestock Officer (Sheep and Wool).

Wollongbar Experiment Farm, Lismore.—Mr. G. Giles (District Agronomist).

Riverina Welfare Farm, Yanco.—Mr. P. F. Stanton (District Agronomist).

New England Experiment Farm, Glen Innes.—Mr. E. C. Powell (District Agronomist).

Senior Veterinary Research Officer.

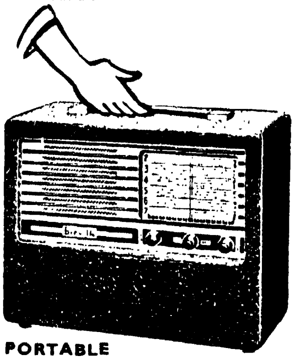
Mr. L. Hart, Veterinary Research Officer, has been appointed Senior Veterinary Research Officer, Glenfield Veterinary Research Station.

Mr. Hart has made a particular study of the various diseases of poultry, in which latter field he is a well-recognised authority. He was first in Australia to recognise the existence of the disease of poultry known as infectious laryngotracheitis, and was closely associated with the development in New South Wales of the present system of vaccination against this disease. He was also the first veterinarian to prove and report the presence of swine erysipelas in New South Wales.

Docket System Introduced at the Sydney Municipal Markets.

COMMENTING on the introduction of the Docket System to cover sales of fruit and tomatoes at the Sydney Municipal Markets as from 1st November, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said, "I am particularly pleased to be the Minister responsible for its introduction. For many, many years growers have been making a strong case for the adoption of such a system, and it is not extravagant to claim that, with its introduction, a new era is opening up for primary producers who use these markets for the disposal of their products."

From the many expressions of congratulation received following announcement of the decision, said the Minister, it was evident that primary producers were fully appreciative of the ready means now provided for them to check the prices received for their products.



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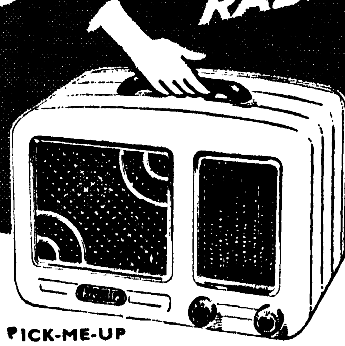

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CHAIN WIRES FOR PLANTING OUT ROW CROPS

To Allow Cross Cultivation

Without Plant Damage.

A. T. GODDEN, H.D.A. and
J. A. LOVERIDGE, H.D.A., Agronomists.

The Chain Planting Wire in Use in the Field.

The use of home-made chain planting out wires, the making and handling of which are described in this article, is an economic and practical method of marking out an area for the planting of row crops so that the main and cross rows are straight—allowing subsequent cross cultivation to be carried out without damage to the plants.

The method has proved very suitable for areas up to 2 or 3 acres in extent, and much greater use could, with advantage, be made of it. It will be found much more satisfactory than the use of twine and in many cases better than furrowing. With large areas, of course, the method becomes impracticable.

The equipment, besides being cheap is durable, and if accurately made may also be used for measuring.

The method is used by a number of growers of Brussels sprouts in the Yetholme (Central Tableland) district and is apparently quite an old one. It has proved suitable for quite a wide variety of crops, including vegetables in trial plots and pasture species in single plant observation trials at Bathurst Experiment Farm. In all cases, it proved to be of great value, both in the ease of and accuracy of the planting out operation.

Materials and Equipment.

The planting wire consists of a flexible "chain" with "links" 2 feet or 3 feet long, depending on the spacing of the crop to be planted; each join or knot, besides being flexible, gives an even planting space. The material required amounts to 14 lb. of No. 16 gauge tie wire for approximately every 400 yards of planting wire required. Lighter gauge wire, besides being prone to damage during handling, also has more elasticity, which may cause inaccuracies in spacing as the planting wire is used, defeating the main objective of the use of the wire.

The equipment required to make up the planting wire consists of two pairs of fencing pliers and a home-made "pattern-block". For the latter a piece of 3-inch x 2-inch hardwood, cut to a length of about 5 feet, will do. Near one end drive a 3-inch nail of fairly heavy gauge as a base pin, leaving about 1½ inch out of the timber. At distances of from 2 feet to 4 feet, in 6-inch stages, and depending on local requirements, similar nails may be driven—to be used as spacing pins. It is necessary to ensure the correct distances required between the outer extremities of the pins and also to stagger the nails in such fashion that there is no obstruction between each one and the base pin. The heads of these nails should be cut off.

Preparing the "Links."

The first operation is to cut the tie wire into lengths 4 inches longer than the link required, to allow for a good tie. It has been found advisable to roughly straighten these wires when they are cut from a coil. The number will depend on individual

Method of Joining Up the Links.
A loop has been made on the end of a " plain " link before tying to a " looped " link.

requirements, but experience has shown that 100-yard lengths are as easy to manipulate as smaller ones, so that even greater lengths on fairly level ground should be found easy to manage.

On about half of these cut lengths of wire make loops on both ends, using no more than the 2 inches allowed for each loop. With one loop made and placed over the "base pin" the other loop can be made by drawing the other end around the spacing pin with a pair of pliers, removing from the block before tying. The size of the loop seems important. Firstly, because a small oval loop gives more flexibility than one with corners and angles, as sometimes happens when made with pliers; secondly, large loops pull out and allow the wire to stretch considerably.

Making the Chain.

To make the wire into a chain from this point entails looping a plain wire through a looped one and tying; placing the newly made loop on the "base pin" and drawing tightly around the pin at the other end with the pliers; then before tying, inserting another looped piece. The operation is carried on in this way until the desired length is made. A small piece of wire about 4 inches long is usually attached to each end of the completed planting wire, to which is attached a 12-inch iron peg.

All ties in the wire should be finished properly to prevent projecting ends catching when the wire is folded. When complete the planting wire may easily be folded into a bundle only the length of each link and tied. In this form it is conveniently handled or stored away, and is very easily let out in the paddock.

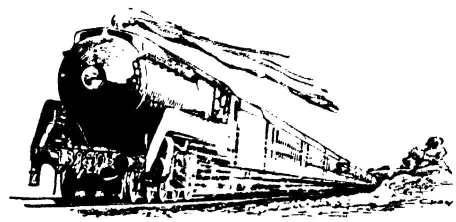
Method of Using the Chain When Planting Out.

The system generally adopted when planting out is to use two such wires—one at each end of the block—as "base wires" and run one or two planting wires between them. Thus, if plants are to be planted 2 feet 6 inches apart in rows 3 feet apart, planting wires with 3 feet links are used for base wires, and planting done along 2 feet 6 inch wires, using the knots as spots for planting.

The Wire Folded into a Bundle for Convenient Storage.

BASED on conditions and prospects existent on 24th October, 1947, the total yield of oat grain from this State for the current season is expected to approximate 18,000,000 bushels, while 495,000 tons of oaten hay are anticipated.

If the estimate for grain is achieved, the yield will greatly surpass the previous record of 9,989,403 bushels harvested in the 1945-46 season.—DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS.



A YEAR IN REVIEW

The Commissioner for Railways, Mr. T. J. Hartigan, C.M.G., has completed his report on the operations of the New South Wales Government Railways for the year ended 30th June, 1947. Interesting facts disclosed include the following:—

Passenger journeys totalled 261,600,000.

In the fifty-two refreshment rooms 8,500,000 meals and light refreshments were served.

Goods tonnage was 16,500,000.

Locomotives ran 43,000,000 miles.

New rolling stock placed in service included six express locomotives built in railway workshops and 300 freight vehicles delivered by contractors. The first three of the 78 carriages for steam trains ordered from contractors in 1943 were received in the railway workshops for installation of air-conditioning plant, seats, and other equipment. It is anticipated that these new carriages will be in service by next Easter. Six freight locomotives were altered to burn fuel oil instead of coal.

The new Hawkesbury River Bridge was opened for traffic on 1st July, 1946, and the last section of the Cootamundra to Junee duplication, between Tanyinna and Bethungra, was completed and brought into operation on 15th July, 1946. Progress was made on the connecting link of the City Railway between St. James and Wynyard via Circular Quay, on the cross-country line between Sandy Hollow and Mary Vale, and on the work of quadruplicating the line between Lidcombe and Penrith. Also, preliminary work was started on the quadruplication of the section between Strathfield and Hornsby, and survey work was carried out on the proposed railways between Inverell and Iluka and in the eastern and southern suburbs of Sydney.

S. R. NICHOLAS,
Secretary for Railways.

PRODUCTION OF FIELD BEANS

In New England.

A Profitable Leguminous Rotation Crop.

(Concluded from page 577.)

J. B. NOONAN, H.D.A., District Agronomist.

THE New England district of New South Wales has proved to be the portion of this State best suited to the growing of field beans, and during the past five years the industry has made considerable progress.

In the first section of this article which appeared in the November issue, the author discussed the place that such a crop could take in the farm economy of the Northern Tableland, and went on to describe suitable soils and cultivation methods.

In this concluding portion the harvesting and marketing of field beans are discussed.

Harvesting.

The most critical period in the production of field beans is reached when the crop is maturing, because once it is ripe, wet weather for a longer duration than a few days can easily damage the seed and reduce its market value. Hence, it is very important that harvesting begin as early as the maturity and weather permit, and further that it be pursued with the utmost vigour.

Unfortunately, modern harvesting equipment—particularly pick-up headers—is costly, and thus this machinery has been provided by pools. This means that growers have to wait their turn for the machinery, and this has often been the cause of severe damage to crops, or even their loss from rain. Growers with larger areas can overcome the lag by purchase of their own equipment and it is considered that a header is warranted where a farmer grows 100 acres or more. The cost of a machine is no greater than the value of the portion of the crop that would be lost in each of several years through lack of a header.

Smaller growers could overcome some of the risk by reverting to the old method of stacking. It has much to commend it where the area grown is less than 30 acres.

On the Northern Tableland, it has been found wisest to leave the crop until it is completely mature and the vines almost dead, but in certain cases—such as late crops or where the season has stimulated growth beyond the normal stage of maturity, thus causing uneven ripening—it is often necessary to cut the beans while the vines are still green. Full maturity harvesting allows of immediate windrowing and threshing if the weather is satisfactory, and thus the risk of staining is reduced. The American method of cutting the crop when it is still green—pods turning golden—has been tried in New England, but the liability to wet weather in March and later in many seasons, makes this method far too risky.

Harvesting is usually done in two stages—first, the cutting of the vines and placing them in windrows, and, secondly, threshing. Straight out heading is too wasteful on account of the low bearing of the pods, due to the reclining nature of the plants.

Harvesting machines, either horse- or tractor-drawn, are used for cutting (or really pulling) of the vines, and handle two rows at once, bringing the pulled plants into what is roughly a single swath. These machines operate by fixed blades which pass an inch or two under the surface of the soil, and it is the rule that portion of most plants becomes covered with soil.

Drying in Windrows.

Immediately after cutting, the plants should be picked out of the dirt and placed in windrows or cocks. Beans partially covered with soil will damage more quickly if the soil is moist, or rain occurs, than plants lying loosely on the surface. Hay forks are usually employed for this work. Side delivery rakes have been tried, but with mature beans, they usually result in

much shattering, and must, therefore, be considered unsuitable generally.

The plants are usually placed in windrows, and this is most desirable if the crop is to be headed. With thin crops that are to be threshed by other means, cocks are usually used. The number of rows placed to each windrow depends on the yield of the crop, and where this exceeds 20 bushels per acre, two rows are sufficient. In moderately heavy crops, four rows are placed together, and in light crops six or more.

It is very important to avoid having too big a windrow, for two reasons:—

1. The header can only efficiently handle a certain amount of material, and if more than this is taken through, threshing is incomplete and wastage of seed occurs.

2. The larger the windrow, the more liable are the beans to damage should wet weather occur, and very large rows might have to be split up with turning for drying.

Crops on very stoney land, or those carrying large or heavy weed growth are hand-pulled, and while this operation is laborious, it has the advantage of allowing the pulling and windrowing to be carried out in the one operation. Hand-pulling will give a more easily threshed windrow, and seed that is much freer of clods and dirt, but it is not easy to get labour to hand-pull large areas. The actual difference in the cost of hand-pulling and windrowing as against cutting with a machine and forking is not very great. Hand-pulling has also been found to be superior on heavy soils.

Should rain occur on the windrows, they should be turned and the plants loosened up to facilitate drying. Hay forks are usually employed in this work, but where the land is stone free, side delivery rakes frequently work satisfactorily. However, they tend to cause shattering as soon as the outer plants become dry.

Threshing.

Threshing may be carried out by three methods, viz., pick-up header; stationary threshing in the field; or stacking, with threshing later.

The header method is the most popular and is recommended for handling large areas. Ordinary wheat headers are fitted with a "pick-up" or "bean" front in the place of the wheat comb, the drum is modified to carry rubber-covered bars and a plain concave, and certain other adjustments are made; these machines do a reasonably good job. However, the necessity for a specially designed bean harvester is obvious when harvesting conditions become adverse. The header method involves the least amount of labour, and usually is the cheapest way of threshing, but with use of "pool" machinery, there is always the danger of wet conditions damaging the crop while awaiting machinery.

Where a header is permanently available, and the crop is clean and mature, cutting and windrowing should be continuous, and this will provide sufficient material for heading in the warmer part of the day. This will involve more labour, but the risk element is reduced to a minimum.

Stationary threshers operating in the field are used by some growers to avoid waiting for a pick-up header, and also with the idea of saving the straw for stock feed. Old English grain threshers or the American pea and bean thresher are used, either by the farmers or by contractors. Considerably more labour is required for this method of threshing if the machine is to be kept operating constantly, and growers with areas up to 25 acres mostly follow this practice.

Stacking has not been very popular since the introduction of the pick-up header, as it requires more labour and is laborious, and also at times immature beans are damaged in stacks. However, with the exercise of care, this method should be more widely adopted where threshing machinery is not available when crops are ready to harvest, particularly by the small and medium area growers. The extra expense involved would mostly be more than offset by the reduction in the risk of damage to crops by wet weather. When beans are stacked they are usually left about six weeks to allow natural curing before being threshed.

In using the various bar drum stationary threshers, it is usually necessary to cover the bars with rubber hose or green hide to avoid cracking and splitting of the seed. The straw is usually baled after threshing and stored away until required. Its value depends largely on the amount of weathering that has occurred after maturity, but usually stock eat it very readily, and it provides useful roughage.

Grading.

After harvesting, the beans are delivered to the grading depots, where modern cleaning machinery is used to prepare them for market. Grading is necessary to remove straw, pods, split beans, mouldy seed, clods and gravel from the seed.

Beans for canning must be of reasonably high standard quality and this involves freedom from foreign matter, mouldy and discoloured seed, clods and split beans. A good white seed of uniform size is greatly favoured by canning firms.

The price to the grower varies according to the grade. Four grades have been established in respect of the 1947-48 crop. They are as follows:—

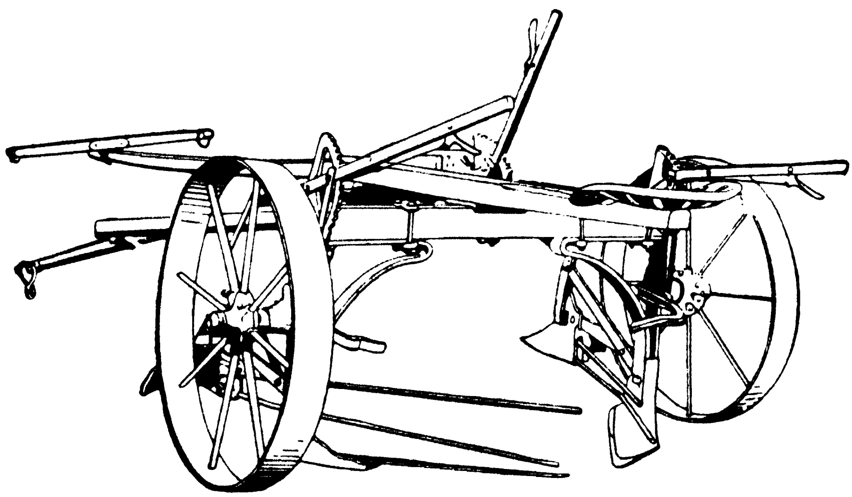
Grade 1. (Not less than 98 per cent. sound beans.)

Grade 2. (Not less than 94 per cent. sound beans.)

Grade 3. (Not less than 90 per cent. sound beans.)

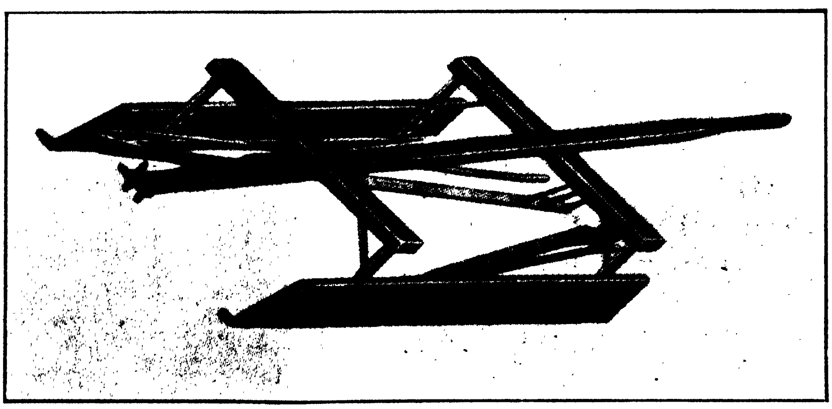
Grade 4. (Not less than 85 per cent. sound beans.)

After grading by the machinery, the beans are placed in new sacks, and each is weighed off at 112 lb. per bag. These small sacks are much easier to handle than the Chapman sack which hold about 200 lb. of prime beans.



Double-row Bean Cutter Used in U.S.A. for Harvesting Field Beans.

Cuts two rows at once and pulls the plants together into single windrow. Harvests 12 to 14 acres a day.



A Double-row Sled Bean Cutter Commonly Used for Harvesting Beans in U.S.A.

Can be home-made at a low cost.

Marketing.

During the war years practically all the beans produced were grown under contract to the Commonwealth Government, but leading canneries also contracted with some growers in New South Wales.

In 1946, following a poll of producers, a Navy Bean Marketing Board was set up in this State with its headquarters at Guyra. The crop grown in the past season was handled by it, and future crops will also be marketed through this Board.

Varieties.

Four varieties have been grown commercially in New South Wales, but the great bulk of beans produced have been of the Little Navy or Small White variety. This bean is a good yielding type which takes about 120 days to mature, and has small seed typical of the type always desired by Australian canners. Little Navy is very liable to second growth if sown before mid-November.

The only other variety now grown to any extent is Michelite, which is about ten to fourteen days earlier than Little Navy in maturity. It is rounder and easily graded, and a little larger than Little Navy, but is excellent for the canning trade. When fully ripe, it is rather brittle and cracking is more common than with Little Navy. It also shatters a little more freely when over-ripe.

Beans Curing in Cocks.

The beans are cut and formed into windrows, then cured in heaps and later threshed.

Stacking Little Navy Beans Prior to Threshing in the Glen Innes District.

NOW, Australian motorists can buy the revolutionary new multi-compounded type oil that has swept America. **It's here**—the New Golden Fleece Motor Oil.

The New Golden Fleece Motor Oil is multi-compounded with six important compounds to **clean engines and keep them clean, improve performance, lower petrol consumption, reduce repairs, lengthen engine life.**

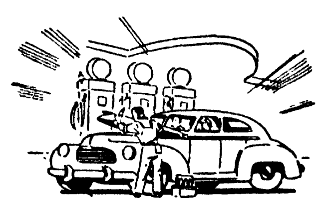
Made from the world's finest crudes, the New Golden Fleece Motor Oil offers all these **extra** advantages **at no extra cost**

Removes:

- **CARBON**
- **SLUDGE**
- **GUM**
- **VARNISH**

Prevents:

- **OXIDATION**
- **CORROSION**
- **ABRASION**
- **OIL FROTH**



MARKETED ON MERIT BY **H. C. SLEIGH LIMITED** "LEADERS IN LUBRICATION"
NEW SOUTH WALES BRANCH: 254 GEORGE STREET, SYDNEY

Two other types which have been grown commercially are Pinto and Great Northern, both are larger seeded than Little Navy. The seed is flat and brittle and thus cracking is liable when the beans get over-ripe. These varieties mature in about 95 days and produce very small vines which are rather difficult to handle after cutting. Because of their quick maturity, these beans are very suitable for late planting, but there seems to be a very limited demand for them by canners.

Diseases and Pests.

The worst disease of field beans is American common blight (*Xanthomonas phaseoli*), and during the last few years it has caused considerable damage in crops of all varieties. The only control measure so far possible is the production of disease-free seed, and this work is under way. However, it will be two or three years before any quantity is available for general commercial use.

Mosaic has occured at times, mostly in Pinto crops, although some lines of Little Navy showed a general infection. Michelite is resistant to this disease. Generally it has not been troublesome compared with American blight.

Root-rot trouble has been recorded on a few occasions, and Pinto appeared to be most susceptible. Only in the 1944-45 season was the disease of economic importance.

The most destructive pest is the rabbit; but hares also cause some damage. These pests are troublesome when the crops have just germinated, but under good farm management, they should not present any great difficulty.

Insect pests are, as yet, only of minor importance, and the only loss of any note has been the occasional damage by cutworms. Use of the Paris green and bran mash baits will readily deal with this pest.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1948.

Guyra	February 13, 14
Bundarra	February 14
Inverell	February 20, 21
Newcastle (P. G. Legoe))	February 25, 26, 27, 28
Dorrigo (W. Tomlinson)	February 26, 27
Bega (Jas. Appleby)	February 26, 27, 28
Armidale	February 26, 27, 28
Tenterfield	February 26, 27, 28
Queanbeyan (Darcy Vest)	February 27, 28
Walcha	March 2, 3
Glen Innes (M. R. Aggs)	March 2, 3, 4
Uralla	March 5, 6
Manilla	March 5, 6
Warialda	March 5, 6
Tumbarumba (Mrs. Roy O'Shea)	March 9, 10
Tamworth	March 9, 10, 11
Cumnock (C. Reynolds)	March 10
Bingara	March 10, 11
Blayney (K. Gressor)	March 12, 13
Quirindi	March 13, 14
Gloucester (Mrs. M. A. Newton)	April 9, 10
Macksville (D. Turner)	April 9, 10
Barraba	April 9, 10
Bellingen (C. P. Franey)	April 12, 13
Grafton (C. W. Creighton)	April 15, 16, 17
Gunnedah	April 15, 16, 17
Hawkesbury District (Clarendon) (T. J. Cambridge)	April 15, 16, 17
Boggabri	April 20, 21
Narrabri	April 23, 24
Urbenville (S. Stoddart)	April 23, 24
Gilgandra (A. Christie)	May 18, 19

Picking the Cherry Crop.

CHERRIES should be picked when cool and dry, and when not more than firm ripe, and owing to the soft nature of the fruit it should at all times be handled carefully. Unless for processing purposes, cherries should always be picked with the stalks intact, and subsequently should be handled as far as possible only by the stalks. However, some varieties—particularly the white sort—are very subject to skin-marking, and handling should at all times be kept down to a minimum.

Care should be taken to see that the fruit spurs are not broken off at the time of picking; much damage can be done to the tree, resulting in loss in succeeding crops, by pickers who are careless in this respect.

"Row-facing" and "bunch-facing" are now prohibited in the packing of cherries.

INSECT PESTS.

Notes contributed by the Entomological branch.

White Wax Scale (*Ceroplastes destructor*).

WHERE citrus or other trees and shrubs are infested with white wax scale, growers and others are urged not to neglect applying an oil spray about mid-December before the young scales begin to produce their protective waxy covering.

When the scales become covered with wax they are not affected by oil sprays, and soda solutions must be used to control them. As soda is likely to be in short supply and may not be readily obtainable, it may not be possible to make later applications of soda solution.

The citrus white wax scale is an introduced African species, which also attacks many native and introduced shrubs and trees including native blackthorn, lilipilly, persimmon, pittosporum, gardenia, guava, etc.

The waxy covering is of irregular form, and well-developed scales may measure up to ⅜ inch across. Where the infestation is heavy, the waxy coverings may merge together.

The eggs are laid beneath the scale covering and several thousand may be deposited by each insect. The young are small, six-legged, active "crawlers" and these commence to hatch from the eggs late in November, and emergence will continue throughout December. Hatching of the eggs is practically completed by the middle of December in lowland orchards, but usually is a little later in the mountain areas.

The young crawlers make their way from beneath the scales to the leaves and there settle along the midribs and veins. Within a day or two, a thin film of white wax is secreted over the top of the body and a white fringe develops around the margins. Where Navel and Valencia oranges are infested, most of the young scales will be found on the upper surfaces of the leaves, but on grape-fruit they may be found on both upper and lower surfaces.

The young scales remain on the leaves for about four to six weeks, and then, by about the end of December or early January, make their way back to the twigs where they settle permanently. They increase in size, and secrete wax more freely, until some ten months later, when fully-developed, they lay their eggs.

Quantities of "honey-dew" are excreted by these scale insects, and sooty moulds, which develop on this substance, may later cover the leaves, stems and fruits upon which it falls.

Control Measures.

Oil Sprays.

Spraying with a white oil emulsion at a dilution of 1 gallon of oil to 40 gallons of water (16 fluid ounces to 4 gallons) is recommended.

It is necessary to apply this spray when the majority of the eggs have hatched and it is usually found, in most seasons, that hatching is sufficiently complete by mid-December. The period during which the spray may be effectively applied extends over about a fortnight, the actual time being about the second and third week in December in lowland areas and a little later in higher areas. The oil spray is ineffective once the crawlers have made their way back to the twigs and have commenced to produce their waxy coverings.

Where it is intended to apply a second oil spray later to control red scale or purple scale, the spray may be diluted to 1 to 60 (12 fluid ounces to 4 gallons) without much loss of efficiency, provided a thorough coverage of the trees is obtained.

Excessive applications of oil in one season, may, under some conditions, affect

the following spring blossoming, and the reduction of the oil content in the December spray is for the purpose of reducing the total amount of oil applied to the trees.

Where Bordeaux mixture is to be applied in December, as part of a disease control programme, the date of this spraying may be arranged to coincide with the white oil spray used for white wax scale control, and the Bordeaux and oil used in combination. Such a combination is very satisfactory, provided the Bordeaux is not stronger than 2: 2: 80. Where mixtures of higher concentration than this are used, the efficiency of the oil spray may be reduced.

Soda Sprays.

Where the oil spray has not been applied to control the larvae, and they have settled on the twigs it will be necessary to apply a soda spray, and the concentration required will depend upon the size of the scales at the time of spraying.

When the scales are still young, and in their "peak" stage, fresh washing soda at a concentration of 10 lb. to 40 gallons of water (1 lb. to 4 gallons) may be used to control them, but where they are larger and in their "dome" stage, it will be necessary to use from 12 to 15 lb. of washing soda to 40 gallons of water (about 1¼ to 1½ lb. to 4 gallons).

Soda ash may be used instead of washing soda, the equivalent amounts being:—For the "peak" stage—soda ash 3 lb. to 40 gallons (5 oz. to 4 gallons) and for the "dome" stage from 4 to 5½ lb. to 40 gallons (6½ to 9 oz. to 4 gallons).

Soda sprays may be injurious to the trees, and some leaf fall may occur following their use, and where Bordeaux has been used the injurious action of the soda is likely to be increased.

White oil and soda may be combined in the one spray to make a combination spray for the control of white wax, red and purple scales, but this combination is likely to be followed by a certain amount of injury, especially to trees which have been sprayed with Bordeaux.

Soda sprays either alone or in combination with oil should not be added to Bordeaux mixture.

When it is necessary only to control white wax scale, the addition of either white oil or red oil, at the rate of ½ gallon to 40 gallons of the soda solution, will ensure that the spray will spread satisfactorily. This quantity of oil also assists in the smooth working of the spray pump.

Citrus White Wax Scale.

Benzene Haxachloride (B.H.C.) in Grasshopper Baits.

SUPPLIES of benzene hexachloride (B.H.C.) have become more readily available and have been used to supplement the better known arsenicals, sodium arsenite and arsenic pentoxide, in preparing poison bran bait for grasshopper control.

The following comments have been taken from reports of experiments carried out by Mr. S. L. Allman, Senior Entomologist:—

Benzene hexachloride is now supplied as a 20 per cent. dust. It is not soluble in water and must, therefore, be mixed with the bran while dry so that every flake is coated with the dust. As the dust is coloured the progress of the mixing may readily be followed, and an even batch assured. Water at the rate of 2½ gallons for each 24 lb. of bran may then be added, and the customary moist mash made.

Mixed baits should not be allowed to stand for any length of time. The arsenical baits are generally accepted as satisfactory provided they are not more than three days old. Benzene hexachloride baits heat in the bags subsequent to mixing, and it is, therefore, suggested that the bait be mixed, as nearly as possible, only in quantities necessary for daily requirements.

A further suggestion is to mix the bran and benzene hexachloride dry, and then to store this poisoned bran mixture ready for final mixing, or distribution, depending on demands. Such a procedure will do away with the reasonable objections of transport authorities, concerning the liquid seeping from the bags of the moistened bait, although it means that the landholder will have the task of making the final mix with water. In spite of this latter drawback, it is probable that the final result would be the more effective use of the bait, as there would be no deterioration if unavoidable delays in baiting occurred, and it would be possible to choose the most effective baiting periods.

Mixing Rate.

Preliminary tests were made with a 10 per cent. B.H.C. dust at the rate of 1 lb. to 24 lb. of bran, but it was later found that this amount could possibly be reduced by half. The present recommendation is to use 3 lb. of the 10 per cent. dust or 1½ lb. of the 20 per cent. dust per bag of bran, which normally weighs approximately 110 lb.

Sawdust.

Sawdust has been used in some districts to augment the rather meagre supplies of bran, but the type available has generally been fresh cypress pine material which is not considered very suitable. Sawdust and bran have been mixed bag for bag, but it is possible to obtain results using a mixture of three bags of sawdust to one of bran. As the bran is the portion of the bait attractive to the grasshoppers, it is preferable to mix the B.H.C. first with it, then add the sawdust and give the whole a thorough mix. It will be found with a mixture of this sort that the amount of water required will be less than the standard of 2½ gallons for 24 lb. of bran, and this will be particularly evident with fresh sawdust.

Results.

Results generally have been very good with the B.H.C.-bran baits, and landholders now voice a definite preference for this type of bait and do not wish to use the conventional arsenical mixture. This is largely due to the rapidity with which the bait acts, as grasshoppers may be obviously affected within a few minutes, although they may take a considerable time to die.

Arsenical baits can be equally effective in their final results, but a lag of 36 to 48 hours occurs before the full effects of the baiting are evident. Although the baited hoppers are comparatively inactive, and do not feed much after taking the arsenical poison bait, it is quite understandable that the more spectacular, and also less dangerous, B.H.C. bait should be preferred.

Another reason for the use of B.H.C. baits is becoming apparent as the results of field trials and experiments are studied. Good kills have been obtained with B.H.C.-sawdust only,* and with sawdust-wheat flour-B.H.C. mixtures. In some instances, also, with th enormal B.H.C.-bran bait, the full effect of the baiting is not apparent for periods as long as three days after, and the swarm disappears, or disperses over considerable areas, without many dead hoppers

* R. Jones, Stock Inspector, Forbes. Unpublished Reports.

being in evidence. The only reasonable explanation of these findings is that the B.H.C. mixtures are exerting a considerable contact poisoning effect.

The generous use of B.H.C. baits on massed swarms would, therefore, tend to produce results under conditions which normally would not be considered favourable for baiting, *e.g.*, periods when active feeding is not taking place due to unfavourable cold, windy, or hot conditions, or when the majority of the individuals are moulting. The contact effect of B.H.C. has recently been demonstrated by extremely good kills of massed swarms when this material was dispersed at the rate of 1½ lb. of crude B.H.C., or approximately 2 oz. of the effective gamma isomer, per acre.

Precautions for Use.

B.H.C. is not an acute poison like arsenic, but is generally considered to be non-toxic to man and higher animals. Even so, reasonable precautions should be taken when it is handled. The most noticeable feature is an objectionable musty odour, and working in an open shed is recommended for hand mixing.

The operator should avoid breathing in excessive quantities of dust, working with a handkerchief over the nose and mouth if necessary. When mixing machines are used, a cover should be made to prevent the dust from flying. The hands should be washed thoroughly after contact, and the eyes washed out if the dust proves irritating.

Fish and Yabbies Killed with D.D.T.

FIVE per cent. D.D.T. in kerosene was used extensively in the North-west Pacific for the control of Anopheline mosquitoes, and the normal rate of application was 1 quart to the acre. Such an application would kill many other aquatic insects, but was generally considered harmless to fish.

Emulsions were considered for this work as they offered some advantages, *e.g.*, drip cans over streams were the conventional method, but it was quickly found that emulsions were toxic to fish in concentrations as dilute as 1 part D.D.T. in 10,000,000. In other experimental work in U.S.A., 1 in 20,000,000 was found to be harmless to fish within six days.

In one experiment trees surrounding a reservoir were sprayed from the air. About 75 points of rain fell within a few days and some of the spray drifted over the water. Analysis showed less than 1 part of D.D.T. per 10,000,000 of water, yet water animals, fish and frogs were killed.

Mr. E. J. Wason, Entomologist, stationed at Leeton, in an unpublished report records the killing of carp and crayfish with D.D.T. In this instance, a Murrumbidgee Irrigation Area grower who had been using a 0.1 per cent. D.D.T. spray, drained his spray plant and allowed approximately 1 gallon to drain back into a dam of an estimated capacity of 25,000 gallons.

Hundreds of carp (*Carassius* sp.) and crayfish or yabbies (*Parachaeraps bicarinatus*) were dead along the banks of the

A Yabbie or Crayfish.

dam on the following morning. The fish and yabbies were still being affected and dying twenty-four hours after the D.D.T. pollution. On the basis of the figures given, the final D.D.T. concentration in the dam would be 1 in 25,000,000.

In addition to the interest attaching to this report, it suggests a possible practical method of control of yabbies.

Control of Meat or Road Ants (*Iridomyrmex rufoniger*) with B.H.C.

A LIMITED experiment for the control of meat ants with benzene hexachloride (B.H.C.) was undertaken in the south-west Riverina by Mr. J. A. Wright, Entomologist.

A dust containing 10 per cent. B.H.C. was sprinkled around a large mound of ants, and small quantities were introduced into the tunnel entrances. The ants were then disturbed by jumping on the nest and scraping the surface, and following this they poured out in vast numbers.

They appeared to be in a state of great agitation and ran madly about endeavouring to climb up any object that would enable them to escape the poisonous fumes.

In countless thousands they climbed up grass and weed stems, and even up the wall of an adjacent shed, but as the poison was beginning to take effect, many were unable to maintain their hold, and most fell long before they reached the top. The shed wall eventually resembled a miniature cascade of ants.

In a little while signs of their distress became more evident—their movements became slower, and convulsive kicking of their limbs indicated the onset of paralysis. Soon, all movement ceased, and dead ants lay around in thousands, in striking contrast to the scene of intense activity but half an hour before.

Approved Vegetable Seed—December, 1947.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these new conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round.—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—*continued.*

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Pumpkin—

Queensland Blue—R. C. Morandini, Box 74, Dubbo.

Tomato—

Rouge de Marmande—H. P. Richards, "Sovereignton," Tenterfield.

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

A Good Rice Harvest.

THE yield of rice this year was much greater than was anticipated earlier, being the third largest crop on record, viz., 54,530 tons from an area of 31,462 acres, an average yield of 1.73 tons to the acre.

Early-sown crops, grown on the lighter types of soil, gave poor yields of from 1 ton to 35 cwt. per acre, and it was expected that the yield from the later crops would be much the same. This was not the case, however, late crops yielding exceptionally well, mostly 2 tons or more to the acre. The grain harvested from all crops was exceptionally good, being large and of low moisture content, due to favourable conditions during the ripening-off period.—DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS.

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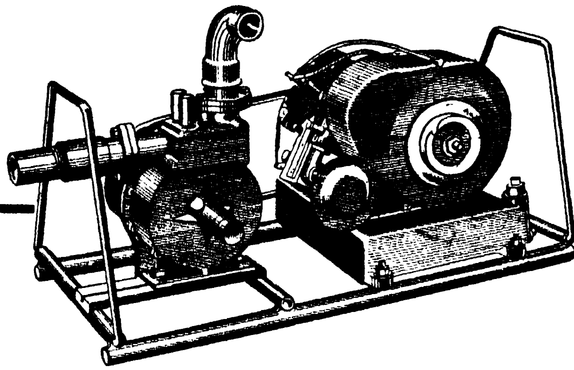

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HAYMAKING
A Means of Conserving Fodder
That is Palatable and Nutritious.

(*Continued from page 599.*)


A Stationary Baler being used with an Elevator or Loading Chute at Hawkesbury Agricultural College.

CONTRIBUTED BY THE DIVISION OF PLANT INDUSTRY.

TO DATE the previous instalments of this article have dealt with the methods of making cereal, lucerne and pasture hay, including the stacking of the finished product.

In the present instalment the baling of hay is discussed.

Baling Hay.

The baling of hay, particularly lucerne hay, has been practised for many years. Until recently baling was normally carried out in preparing material for sale, while hay in baled form was used to a very limited extent for storage on the farm. Large bales weighing upwards of 160 lb. and held together by wire and battens were popular.

In recent years, particularly since 1940, the practice has become much more popular. Considerable quantities of hay are now pressed annually both for sale and for storage on the farm. Both lucerne and cereal hays are handier and safer if pressed into bales than if stacked loose in the ordinary way or stacked in sheaves.

Baled hay retains its colour and nutritive value much better than stacked hay, and its vitamin content is less liable to suffer during storage in this form. A properly pressed bale is less liable to attack by mice and birds, and hay so prepared occupies less shed space than loose hay. The loss of valuable leaves from lucerne hay is reduced and the handling of the material from the stack is greatly facilitated. When it comes to feeding out in dry periods, it is easier to take out a few bales than to break a stack, and as the weight of the bale is known, the quantity of fodder fed to any flock can be judged accurately.

Baled hay is easily handled on rail, and baling offers a great opportunity to mixed farmers in the wheat districts to store hay for their own use, any surplus being sold in times of drought to graziers further west who do not grow hay. In drought periods very good prices are realised for baled hay, while the advantage of having quantities of baled and stacked hay in wheat districts, from the farmer's own viewpoint and that of the nation, is readily seen. Sheep can be more safely carried in these particular parts, and in times of drought, which inevitably occur, a good supply of excellent fodder is available, in a handy form, in close proximity to where it is needed.

The original cost of baling hay is higher than putting it into a stack. In a district where baling costs between 22s. 6d. and 25s. per ton, carting in and stacking is estimated to cost 15s. to 17s. 6d. The cost of baling is the same whether carried out from the field or from the stack; in fact, baling from the field is more convenient in some respects than breaking up a stack.

Stationary Balers.

Of the specialised pressing machinery developed for pressing hay, the most common type at present is the portable baler which is mounted on wheels, permitting of easy transport. This machine, drawn by two horses, can be used in the field, moving from stook to stook and dropping off the bales as it moves. A reasonable price for baling, using two wires, is at present between 22s. 6d. and 25s. per ton.

These machines are made in two sizes, one retailing for a little more than £100, while the larger size varies in price between £200 and £260 depending on the maker.

Power is provided by a 6- or 8-h.p. motor, but as these machines are commonly under powered, it is recommended that at least an 8-h.p. motor be used. Most models are also made with power take-off drive.

For the farmer pressing small quantities of hay for his own use, the small size press is usually big enough, and its capacity should be about 1 ton per hour under average conditions. Three men, or even two, could operate it. The larger machine is favoured by contractors and is usually operated by a team of four men, two feeding the sheaves or loose hay into the box, and two wiring the bales and changing the boards. Such a machine could reasonably be expected, under average working conditions, to give an output of 16 tons of oaten hay per day, comprising 400 to 500 bales, weighing, according to the nature of the crop, from 23 to 30 to the ton. Wheaten hay grown under the same conditions would give a bale weighing 80 to 85 per cent. as much as oaten hay.

It will be seen that it is not possible to give any hard-and-fast rules for costs, as price is affected by the nature and type of crop, climatic conditions and travelling time involved. Experienced operators of contract plants state that the size of machine is not as important as the class of labour available. A skilled contract team can handle as much on the small machines as inexperienced men on the larger models.

Pick-up Balers.

The most recent development in baling equipment is the pick-up baler, driven by a power take-off from the tractor and priced at about £600 to £700. These machines pick up the hay from the windrow, and the material is not handled until it reaches the stage where the wires are tied. The windrows are prepared by the use of a side delivery rake or by using a binder with the knotter disconnected. A binder taking a fairly wide cut or a tractor mower with up to a 7-ft. knife bar is preferred so as to give plenty of material in the windrow.

In the use of machines such as this type of press and power binders, a tractor with a large range of ground speeds is essential to cope economically with different classes of crop. Tractors with four working speeds and governing at all engine speeds allow the speed of the pick-up or mower blade to be kept at the right value while travelling at varying rates through thick or thin crops. Better still, an auxiliary-engined plant may be used; the extra cost is easily justified.

Machines like the pick-up baler referred to handle on an average 4 tons per hour, although in good crops up to 6 tons per hour may be baled in patches. Three men are needed for its operation and one or two for loading the bales. The most recent machines either automatically measure each bale and eject the dividing "boards," or, in the case of the so-called "one-man" baler which is driven by an auxiliary engine, actually tie the bales with twine. In tests this machine baled four and a half 63-lb. bales of lucerne hay per minute from an average crop.

It seems likely that a device for tying the wires on bales will be developed, but twine, although it would not be as long lived as wire, has advantages over the latter. Baling tie-wire is nearly indestructible, and if left about the paddocks when bales are opened may later give trouble with cutting or harvesting machinery. A tarred twine is sometimes used for stack thatching, and this is fairly resistant to weather. By the use of twine such as this, or twine specially impregnated with chemicals to resist rotting, the ties should be fairly long lived and quite satisfactory.

Another interesting and useful innovation on the latest pick-up machines is a sliding cut-off knife, which cuts the bale into sections like a packet of biscuits. This should greatly facilitate feeding, as the difficulty of extracting material from the tangle in the usual bale is avoided and the amount fed can be gauged more accurately.

Operating the Baler.

The ordinary portable baler is fed with sheaf or loose hay into a box, the sheaves being pushed into the box by an oscillating arm or "magpie." The bands are not cut. As the arm lifts out of the box, a plunger, working horizontally, rams the material into a chute about 8 feet long, where it is prevented from springing back by four pawls at the side of the chute, under pressure. The pressure and hence the tightness of the bale is varied by tension screws at the delivery end of the chute which close or open the mouth to some extent. At distances equal to the length of the bale, boards are placed between the layers of pressed

material. These boards have grooves across both faces through which the tie wire is threaded and tied; one wire is tied on one side and the other on the other side of the bale. The board is placed in a carrier, in which it is held until the box is emptied, when the carrier is raised, and on its next trip the oscillating arm knocks the board into the box and the plunger pushes it past the pawls.

Hay for export interstate should be tied with three wires, which necessitates a variation in the type of board used, an extra groove being cut across the centre. The use of this extra wire usually increases the price by 2s. 6d. per ton. At present, payment on contract rates is usually 2s. 6d. per ton each for the four men working the baler, and the cost of wire for wiring with two wires works out at approximately 2s. 6d. per ton when coils of wire are used. Wire can be purchased in ready-cut lengths with a loop already made in one end, but this wire, of course, is more expensive per ton than the ordinary reels of 14-gauge black wire usually used. Galvanised tie wire is also used on occasions, but generally speaking black wire is sufficient.

The boards, as they get older, sometimes clog in the grooves, making the threading of the tie wire difficult. This can be avoided to some extent by the provision of metal strips on either side of the groove to protect the edge. A small metal shoe on the edge of the baling board to prevent injury as it is knocked in by the "magpie" is also considered an advantage by some operators.

Care is needed to prevent excessive overloading of a machine, particularly when handling a very heavy crop, and it is not wise to try and put too much material in a bale by increasing the tension unduly. The working parts of a baler are subject to quite large stresses and receive rough treatment in travelling over cultivation paddocks.

A Trailer is Useful.

One handy innovation used with plants which are drawn about the paddock is a small tipping trailer mounted on two wheels and drawn behind the baler. Four to six bales can be placed on the platform of this trolley and dumped in piles more convenient for handling than scattered bales. With pick-up balers a trailer may be drawn behind and loaded direct from the chute.

A Shed of Bailed Hay.
Note the high fence to provide protection from rodents.

The stage of dryness of the hay is important in baling, as if the material is too wet, rapid fermentation can go on with consequent heating in the tightly packed bale. Bales are often stacked on one end, when oblong in shape, to permit of better air circulation while undergoing the final drying in the paddock.

Storing Baled Hay.

The best way to store baled hay, of course, is in a hay shed, or else large stacks can be readily made with the easily handled bales, and in this case the expense of roofing with galvanised iron is justified. The iron is placed over rafters and held down by timbers across the top, wired to the rafters at each end. Iron attached in this fashion has no holes punched in it and will last for a very long time.

Alternatively, stacks can be built with a high pitched roof and thatched with straw, or with other bales, but the money expended on a proper covering is well spent. The side of the bale which travels along the top of the chute has the butt ends of the straw projecting and flattened back in one direction. This side of the bale will turn a light shower quite well, and is almost impervious to water, but as the hay commences to deteriorate a stage is reached when the water readily penetrates.

Bale of Hay Ready for Removal from a Wool Press.
Note the false bottom in the press and the grooved boards nailed to the lid.

Improvising a Hay Baler from a Wool Press.

Many inland farmers growing lucerne, either under irrigation or on grazing areas, have, at times, suitable cuts which would make excellent hay.

A baling plant, while necessary for men handling large quantities, is too big an outlay for the small man who does not make hay regularly, while under these conditions a wool press is nearly always to be found on the property. Both lucerne and oats have been successfully conserved by the use of the method outlined.

The press is mounted on a home-made slide, wedged instead of bolted, to prevent strain on the press while travelling over uneven ground.

If possible the press should be driven by a 3-h.p. engine, but hand power may be used. A false bottom is placed in the press about 7 inches high (see illustration), and grooved pieces of wood are nailed on to the lid of the press to enable the binding wire to be pushed through after pressing (also shown). Two pieces of 14-gauge wire are then looped at one end and held on one side of the press just above the door. These wires run around inside the box, sufficient wire protruding on either side of the box to allow tying.

The hay, cured in the field in the usual manner, is well tramped into both boxes—and once in position it takes only two minutes for the engine to complete the pressing. The top is then removed, the wires passed through the slots in the lid and joined with the looped ends and the bale is complete.

The weight of a bale of lucerne hay pressed in this maner is approximately 160 lb., loose oaten hay 150 lb., and sheaf oaten hay 180 lb.

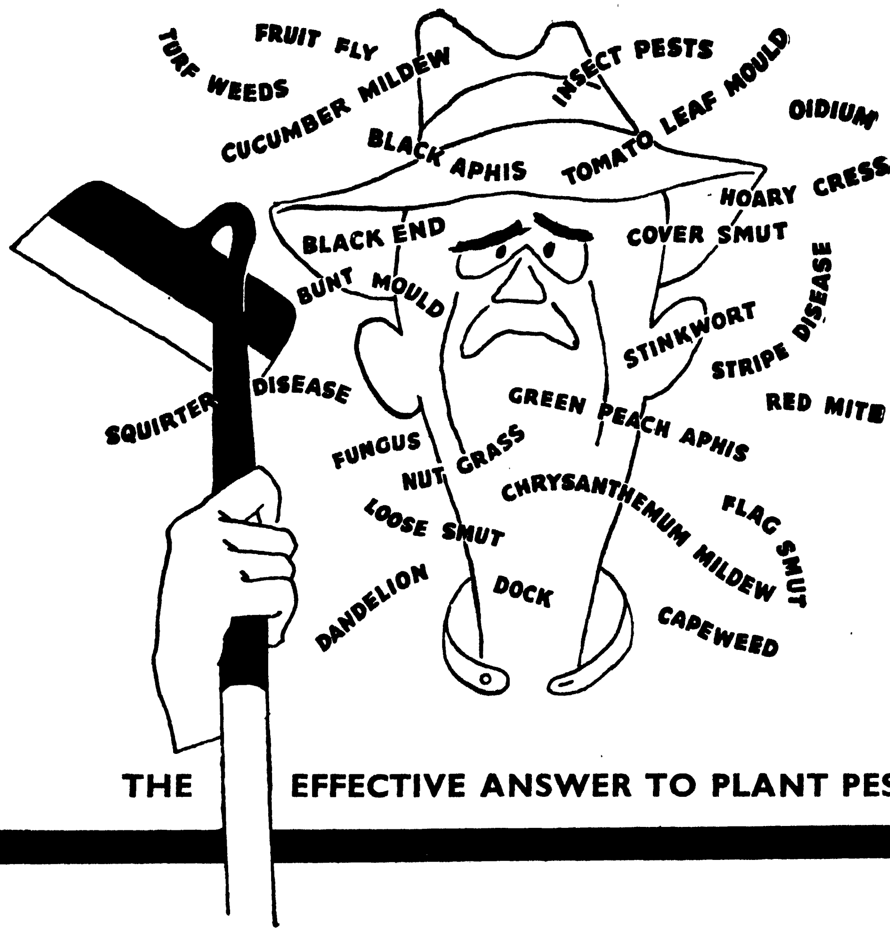
Somewhere between forty and fifty bales per working day can be pressed by four men with a boy on the rake keeping the hay up to the pressers.

Rakes.

Several types of rake are used in haymaking, and for lucerne and loose grass or cereal crops the ordinary dump rake, which is so well known as to hardly need description, is still commonly used. These rakes consist of a series of semi-circular spring steel teeth which pick up the material in a bundle and carry it along until a sizable quantity is collected. Pressure on a foot pedal causes a small ratchet in the hub to engage and lift the teeth, dumping the collected grass or lucerne.

For ease and convenience in handling, the windrows should be more or less in straight lines across the paddock. Therefore when commencing to rake on the outside of a paddock where the crop may be thinner than further in it is wise not to take too much in the rake before dumping, as in the thicker patches too much may have to be carried in the distances between succeeding windrows.

A more modern implement is the side delivery rake which consists of two or more comb-like arms driven by a power take-off from the ground wheels of the implement. These arms move up and down, and when at the lower limit they pick up the cut material and, as they are set at an angle to the direction of travelling, rake it along into a heap or windrow parallel to the direction of travel. At the completion of this



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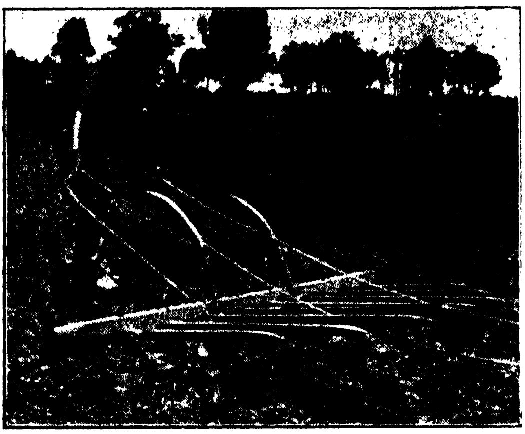
operation the particular arm concerned rises while another is meantime travelling down and has commenced collecting a further quantity to repeat the process.

The Sweep Rake or Tumble Sweep.

Two further types of rake which are somewhat similar in principle to one another are used, and are particularly useful in crops which are cured in the swath. They consist of a series of fingers, usually of hard wood tipped with metal, which are drawn or pushed along and gather up grass or lucerne during their progress.



A Dump, or Tumble Rake.

The sweep rake which is pushed by two horses or a tractor is made in quite large sizes, taking a 10- to 21-feet sweep as a rule, and the teeth are upwards of 6 feet long with a hurdle type stop across the back. Material moves over the teeth as it is picked up and banks up against the hurdle. A considerable load can be piled on to the rake which is then lifted from the ground by a lifting mechanism and travels on wheels to the site where the hay is to be dumped, which may be an elevator, or in the vicinity of the baler where this machine is working in a stationary position. Sweep rakes are frequently used in silage making.

The second type of rake of this character is the "tumble sweep," and such a rake is very convenient for handling loose crops. Any handy man can easily construct one at a very low cost, although machinery firms have them for sale.

The tumble rake can be used in gathering crops which are too light or thin to handle with the reaper and binder; crops as light as 8 to 10 cwt. to the acre can be successfully picked up with this implement, and any crop lighter than that is hardly worth handling. When used in haymaking it can be successfully employed in bringing material from the swath to the baler when this machine is working in a stationary position. Up to 20 acres can be baled without moving the machine. In a reasonable crop of 1 ton or so per acre one tumble rake requiring one horse and a boy to operate it should be able to keep the hay up to the ordinary stationary baler.

The construction and operation of the implement is shown in the illustrations, and it will be seen that it consists of a comb-like implement having about eight fingers which vary in length from 2 feet 10 inches at the outside of the beam to 3 feet 9 inches for the second fingers from the outside and 4 feet 3 inches for the four inside fingers.

In a machine of this nature constructed at Hawkesbury College the main beam was constructed of 4-inch x 4-inch hardwood 9 feet long, and the fingers of 2 inches x 1½ inches hardwood, with the ends sharpened downwards so that the teeth pick up right down to ground level. Two coach screws 7 inches long by ½ inch diameter are set in the end of the beam, and to these the swingle bar chains are attached. The handles consist of two 5 feet pieces of 1-inch water-pipe curved for the purpose and properly

The First Tumble Completed.
The load is emptied from the rake.

braced with angle iron stays. The stays from the main beam to the handles should extend past the handle at least 4 inches.

When tumbling the handles are lifted slightly so that the teeth dig into the ground and the horse pulls the beam over dumping the load. The two projections on the angle

iron stays then dig into the ground, causing the rake to turn over again and complete the tumble, landing right way up. The rake does not have to be handled after starting the tip until leaving for the next load.

Tumble rakes, apart from picking up the hay quickly and efficiently, leave a very clean stubble. The materials required to construct a tumble rake at present prices would cost less than 30s.

In a light crop of 10 and 12 cwt. to the acre hay can generally be baled with safety within 36 hours of cutting.

By the use of this type of rake equipment, the cost of baling with a stationary baler is very little, if any, more than with the pick-up machine. The low initial cost of the statonary baler is all in its favour where areas up to 200 acres are to be handled. The small size stationary bale will handle up to 45 bales per hour and the larger size is rated at 90. The pick-up machine is rated at 120 bales per hour, and when small areas like that mentioned are to be handled, the extra capacity is not needed.

Loading Chutes and Elevators.

When the baler is working in stationary position, the use of a loading chute saves the work of one man in lifting bales away from the machine and up to the lorry. Such a chute was designed and used at Hawkesbury Agricultural College and elevated bales without difficulty to a height of 9 feet. The chute used was 20 feet long, the sides being made of 5 inches x 2 inches hardwood, and the bottom of two pieces of 4 inches x 1 inch spaced to give a 15½ inch floor, which was the width of the bale made by the baler used. The two floor boards were kept in place by six supports, one at each end and the others 4 feet apart. Each spreader was 20 inches long and of 5 inches x 2 inches, and further secured by strips of hoop iron 24 inches long.

The end of the chute that meets the baler is supported by two legs 2 feet long of 4 inches x 3 inches timber. These legs are strengthened by a piece of ½-inch piping 17¾ inches in length, used as a spreader with a 2 feet x ⅜-inch belt passing through both of the legs and the pipe. The legs are further secured by two stays of 1¼ inches x ¼-inch flat iron, each 3 feet long, from the legs to the chute. The other end of the chute rests on the lorry or bales as the bales are stacked.

The baler forces the bales up the chute and it would be necessary to reduce the tension on the end of the baler body because of the extra pressure needed in raising the additional bales. Four extra baling boards are required as they cannot be taken from between the bales until the end of the chute is reached. One man's labour is saved and it is easy to make stacks of bales, or to load in the waggon up to 14 feet high from the ground as the elevator raises the bales 9 feet and a man can lift them a further 5 feet.

Power-driven Elevators.

Descriptions of an elevator for lifting sheaf hay to the stack, and of an elevator for bagged wheat which could probably be adapted for lifting the baled hay to a greater height can be provided by this Department. These elevators are powered by a 3 h.p. motor, and a handy man could make one at a cost of about £30. Plans are available from the Department, but some knowledge of the reading of plans is necessary for their correct interpretation.

(To be continued.)

Citrus Black Spot in Export Fruit.

ORANGES from coastal districts which were sent to Singapore recently in unrefrigerated space arrived showing heavy black spot infection, although on inspection at Sydney this fruit did not show any symptoms. This is quite typical of the disease, and it is believed that the rising temperature in the ship's hold started off the fungus which had been dormant at time of shipment.

As this state of affairs is likely to recur, it has been decided to discontinue export of all such fruit except in refrigerated space. This class of fruit arriving on a market which is being supplied with good quality South African Valencias will have a decidedly detrimental effect on Australian produce. Furthermore, with a return to normal shipping conditions, very keen competition can be expected from Californian citrus fruit.—R. J. BENTON, Principal Fruit Officer (Extension).

PLANT DISEASES

Notes contributed by the Biological Branch

Treatment of Cauliflower, Broccoli, Brussels Sprouts, Cabbage and Turnip Seed.

DISEASES of cabbage, cauliflower and related crops which are seed-borne and which can be controlled by a hot water treatment of the seed, are black rot, caused by the bacterial organism *Xanthomonas campestre,* **and black leg, caused by the fungus** *Phoma lingam.* **Black rot is the more common and important of these two diseases and sometimes causes heavy losses, especially in cauliflower crops.**

It is strongly recommended that seed of cauliflower, broccoli, brussels sprouts, cabbage and turnip be treated in hot water before sowing unless the seed is known to be disease-free.

Cabbage and turnip seed should be treated for 25 minutes and seed of other crucifers for 18 minutes in water at a temperature of 122 deg. Fahr. A large volume of water (say 3 or 4 gallons) should be heated to 122 deg., and provision made to maintain it constantly at this temperature by the aid of a small flame. The seed is tied loosely in cheese-cloth bags and suspended in the water for treatment. After treatment, the seed is spread out in a warm, shady place so that it may dry rapidly. Seed may become mouldy if drying conditions are not satisfactory.

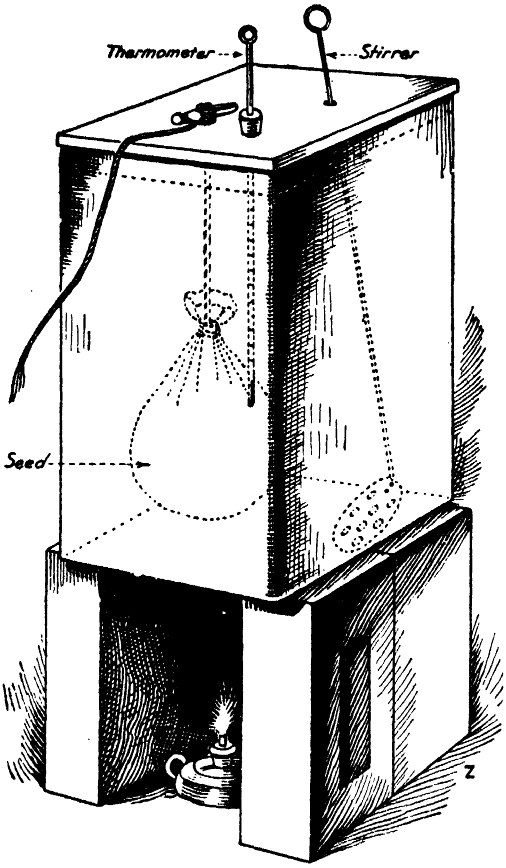
A kerosene tin, provided with a wooden lid in which two holes are bored, one for the thermometer and the other for a stirring stick, constitutes a convenient apparatus for the hot water treatment. The stirrer can be made by soldering a piece of stout wire to a disc of galvanised iron about 6 inches in diameter.

The cheese-cloth bags should not contain more than about ¼ lb. of seed. The small flame needed to maintain the temperature of the water at 122 deg. Fahr. is most conveniently secured by using a small kerosene lamp, of which the wick can be turned up or down as required. The thermometer should have a plain glass stem so that it can be easily put through the hole in the wooden lid into the water in the kerosene tin. Such a thermometer costs about 6s.

It will be found much easier to maintain the required temperature if draughts and air movements are avoided, and for this reason it is advisable to carry out the treatment in a shed, rather than in the open. It must be emphasised that special care is needed in maintaining the water at the exact temperature for the exact time, and before treating any seed a trial run should be made in order to ascertain whether this can be done.

The Corrosive Sublimate Treatment.

The hot water treatment may result in a lowering of the germination capacity if the seed is of low vitality. If this is the case an alternative method—dipping the seed in a corrosive sublimate solution at a strength of 1 in 1,000 for 30 minutes—should be adopted. This treatment is not as efficacious as the hot water method, since only the black rot germs on the outside of the seed coats are killed, whereas both those outside and inside the seed coats are killed when the hot water method is used.



Apparatus for Hot Water Treatment of Seed.

Corrosive sublimate (mercuric chloride) may be purchased from most chemists at a cost of about 1s. 6d. to 2s. per ounce. The solution is prepared by dissolving ¼ oz. of the chemical in a little hot water, and adding sufficient cold water to make 12½ pints of solution. A wooden, earthenware, or glass vessel should be used to hold the solution, as it will attack metal. The seed is placed in a piece of loosely-woven material, such as cheese-cloth, and given sufficient agitation to remove air bubbles. Soak the seed for 30 minutes, and follow by repeated rinsing in clean water. Spread the seed out in a thin layer to dry in a warm, shady place. *Since corrosive sublimate is a deadly poison, care should be taken to keep the solution out of the reach of children and farm animals.*

Dusting to Control Rotting and Damping-off.

After the seed has been dried, whether treated in hot water or corrosive sublimate, it is a sound practice to dust it in a mercurial seed dust (*e.g.*, "Agrosan," "Ceresan" or "Semesan") at the rate of ¼ to ½ level teaspoonful per pound of seed. This treatment will assist in preventing seed rotting and damping-off caused by soil inhabiting fungi.

Other measures for the control of diseases of cabbage, cauliflower, etc., together with descriptions of the various diseases affecting them, are given in Plant Disease Leaflet No. 87, available from the Department.

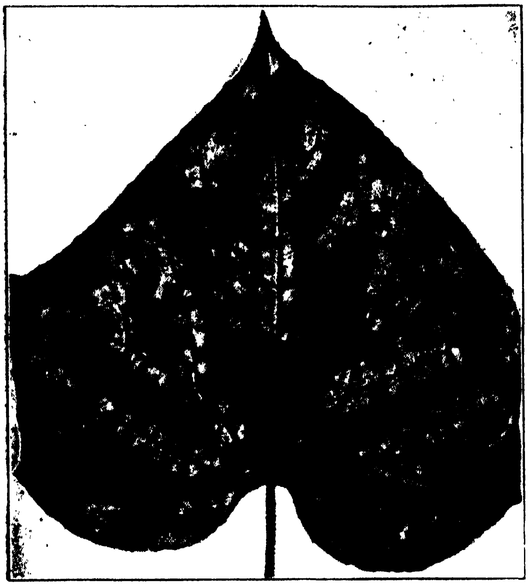
Mildew Diseases of Cucumbers, Pumpkins and Related Vegetables.

CUCURBITS are subject to two mildew diseases—powdery mildew and downy mildew. Both are prevalent during warm, humid weather, but powdery mildew can also develop under relatively dry conditions.

The powdery mildew fungus (*Erysiphe cichoracearum*) attacks all varieties of commonly cultivated cucurbits, but most severe injury is caused to rockmelons, cucumbers, pumpkins, squashes and marrows. The first visible signs of the disease are white powdery spots on the shaded portions of the main stems close to the soil, and on the under-surfaces of the older leaves. Later the spots may coalesce and cover the whole leaf surface. Once established the disease spreads rapidly throughout the crop. In

dry, hot weather, affected leaves wilt and die quickly, the growth of the vines is checked, and the fruits which are suddenly exposed to the sun are frequently scalded.

The downy mildew fungus (*Peronosplasmopara cubensis*) also attacks all cultivated cucurbits, but as a rule only cucumbers and rockmelons are injured seriously enough to



Downy Mildew of Cucumber.
[*After Weber.*

cause losses. The disease appears as more or less angular, yellowish spots on the leaves, and on the lower surface of these a rather scanty white downy growth develops. This downy growth is often so scanty that it cannot be seen with the naked eye. The individual spots are rarely over ½ inch in diameter, but may coalesce, resulting in the ultimate death of the whole leaf.

Control Measures.

Downy mildew can be kept in check by the use of copper sprays and dusts on the foliage, whilst powdery mildew can be controlled by both copper and sulphur fungisides. Sulphur dusts and sprays, however, are liable to cause injury to rockmelons and cucumbers especially the former and particularly in hot weather.

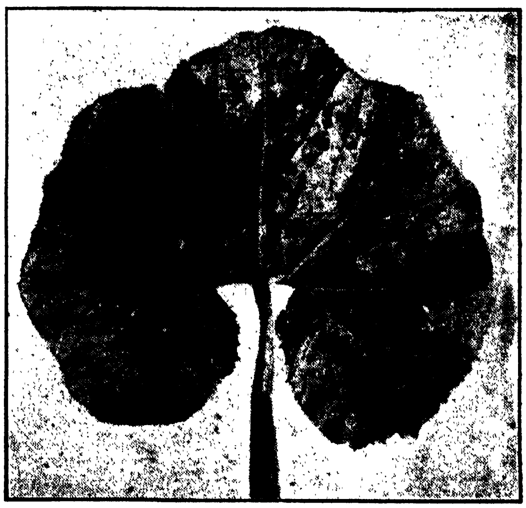
Dust and spray treatments recommended for the various crops are:—

Pumpkins, Squashes and Marrows.—Sulphur dust applied at weekly intervals. The sulphur dust used should be a fine grade of dusting sulphur.

A convenient method of applying sulphur is by means of a dust gun, of which several Australian makes are on the market. In small areas such as home gardens, however, good coverage can be obtained by a dust shaker, made from a lidded tin with fine holes punched through the bottom.

Rockmelons and Cucumbers.—Bordeaux Mixture 3-4-40 (see Spray Leaflet No 1 available from the Department) applied at weekly intervals. Bordeaux mixture is cheaper and more effective than any of the substitute copper spray materials on the market, but in the case of small plots where not more than a few gallons of spray are required, growers sometimes prefer to use a Bordeaux substitute which needs only to be mixed with water. Copper oxychloride with a suitable dispersing agent incorporated in it is the most satisfactory of such materials. Proprietary brands of copper oxychloride suitable for spraying include "Cuprox" and "Oxicop" used at the rate of 1 ounce to 2 gallons of water.

Where rockmelons are grown in dry climates normally unsuitable for the development of downy mildew, and where powdery mildew is the only one of the two mildew diseases of any consequence, spraying need not be carried out if the variety Powdery Mildew Resistant No. 45 is used. This variety is similar in other respects to Hales Best.



Powdery Mildew on the Under-surface of a Pumpkin Leaf.

Bean Seed Certification.

THE bean seed certification scheme, introduced mainly for the purpose of controlling the bacterial blight diseases, was continued during 1946-47, the fourth successive season of operation of the scheme. A total of 964 acres was inspected, and of this 545 acres were passed for certification. Somewhat more than 6,000 bushels of dressed seed have been certified. Of this total about 66 per cent. was Brown Beauty, 22 per cent. Hawkesbury Wonder and the remaining 12 per cent. comprised the varieties Tweed Wonder, Wellington Wonder, Canadian Wonder and Landreth Stringless Greenpod.

With reference to inspections of seed crops in the coming season (1947-48) no alterations have been made in the rules relating to applications for inspection, seed origin, land eligibility, isolation or tolerances for disease and varietal impurities.

Alterations have, however, been made in respect to the number of field inspections and in the matter of fees. Previously most crops received two field inspections during the growth of the crop. In the coming season, seed crops submitted for certification will, as a rule, receive only one field inspection although, in special cases, two or more inspections may be made. In order partly to offset the cost of certification incurred by the Department, a fee of 2s. 6d. per bushel will be charged on all certified seed at the final sealing and tagging.

A copy of the rules covering bean seed certification may be obtained on application to the Department.

Certified Seed is Sealed and Labelled.

Certified bean seed may be distinguished by the fact that each bag is sealed with a lead seal stamped "N.S.W. GOVT." and labelled with a blue certification label (see illustration). The crop reference number consists of a letter and two numbers. The letters refers to the locality in which the seed was grown, e.g., K indicates Kiah, BG Bega, BM Bermagui, BD Bodalla, E Eurobodalla, N Narooma, M Moruya, and so on. The first number refers to the year in which the seed was harvested, *e.g.*, 46 indicates 1946 and 47 indicates 1947. The last number is the number referring to the particular certified seed crop. Each seed crop when it has passed the final field inspection for certification is allotted a number. Thus on the label illustrated, the seed was grown in the 1946-47 season at Narooma and the number allocated to the crop was 86.

Bean seed growers desiring to have their seed crops inspected for certification are required to retain all blue certification labels from the seed sown as proof of the origin of the seed. It is also advisable for green bean growers to retain these labels so that the origin of the seed may be traced, should the grower be either favourably or unfavourably impressed with the performance of the seed, particularly in reference to the presence or absence of seed-borne disease.

The Blue Label of Certification which Accompanies Each Unopened Bag of Certified Seed.

FRUITGROWING.

COOL STORAGE OF APPLES AND PEARS.

Importance of Harvesting Maturity.

E. C. WHITTAKER, Fruit Officer.

THE cool storage of apples and pears has developed into a specialised and highly technical service, and the output of New South Wales cool stores, speaking in general terms and particularly of those stores located in the various growing areas, has been reasonably satisfactory.

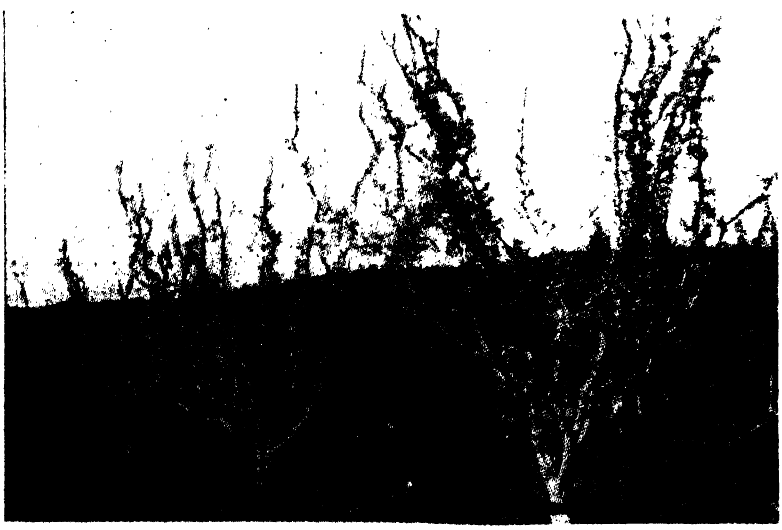
However, the fact that each year a percentage of fruit arrives in the Sydney market in anything but prime condition points to the fact that there is still room for improvement, especially in regard to those varieties marketed during the late spring and summer months.

The average grower's first and somewhat normal reaction when it is indicated to him than this fruit is perhaps not keeping as well as could be expected, is to blame the cool store management for some malpractice or other during the storage period. In very isolated instances he may be right, but when one considers the all-important fact that the treatment the fruit receives prior to cool storage determines to a very large extent its cool storage life and its behaviour ex-cool store, then it would be safe to assume that in the majority of cases the blame for any unexpected deterioration in the fruit could be placed on the grower himself and not on the cool storage system or management.

The fact is not sufficiently appreciated apparently that the engineer in charge of a cool store has a relatively simple job by comparison with that of the grower.

The Grower is Responsible for Pre-storage Condition.

It is the grower's responsibility to decide when to pick and what fruit is suitable for long period storage or for only a short storage period, while the actual handling during harvesting, grading, packing and carting is also under his personal control. All these factors individually and collectively have a direct bearing on the ultimate condition of the fruit, and seldom is a cool



Fruit for Long Storage should be Harvested from Older Trees Carrying Full Crops.

storage engineer in a position to influence any of them to any great extent.

The engineer must be a specialist at his own job, but he need not necessarily be also an expert in fruit-growing. His responsibility commences once the fruit has reached the cool store but, as previously mentioned, the behaviour of such fruit may be, and very often is, determined before this time. Hence to hold the engineer entirely responsible for any trouble in his store without making an effort to trace the real source of it is a very "one-eyed" way of approaching the matter.

Maturity of the Fruit is the Most Important Consideration.

Of all the various factors influencing the condition of apples and pears under cool storage conditions, the maturity of the fruit is the most important and gives the most trouble. This is only to be expected, as picking for cool storage purposes calls for a nicety of judgment, only gained by considerable experience—which is not acquired by the average man in a season or two.

Harvesting for immediate marketing is a relatively simple matter, as the fruit can be left on the trees until such time as it is obviously approaching a degree of ripeness consistent with optimum palatability. But fruit intended for even a reasonably long storage period must be picked before this stage, as ripening still continues in the cool store—it is slowed down by the low temperatures but is far from being entirely suspended.

Hence it is that experience of what is required is so necessary. Unfortunately this particular type of experience is, by the nature of things, rather difficult for the average grower to acquire.

A Good Windbreak Prevents Marking and Breaking of Skin.

Storage Breakdown is Not Immediately Evident.

If fruit develops fungal rots of various types, the grower will usually notice it on removal, and if he is wise will usually seek the primary cause, such as stalk or fingernail punctures, bruises and abrasions at some period during handling, and endeavour to eliminate such sources of trouble next time. On the other hand, however, troubles incurred from picking immature or overmature fruit are not so easily recognised on removal from storage, as such things as lack of palatability, core flush and breakdown may not develop until days after such removal. By this time the fruit is in the hands of the retailer or consumer, neither of whom is interested in the grower's difficulties and usually is only concerned with the fact that he has paid a big price for a very inferior article.

It is obvious, therefore that careful consideration should be given to the handling of fruit intended for cool storage. Especially is this the case where long storage fruit is concerned. Such fruit has not only to withstand a lengthy period of storage during which it is slowly ripening, but is marketed usually during the hottest period of the year when, once removed from store, natural conditions favour a very rapid deterioration. Fruit included in this class should not be too mature when harvested and should have special attention in the way of prompt storage facilities.

This type of fruit is far too frequently allowed to stand for weeks in orchard sheds, owing to the fact that all available cool store space is occupied by relatively inferior types, and any advantage gained by harvesting at the correct stage is lost by this common storage period.

Mechanical Aids to Maturity Determination.

However, it is the intention here to deal more specifically with the question of maturity rather than general details affecting storage, and in this respect mention will be made of the various mechanical aids which have been developed over the years to assist in determining maturity standards. Of these, colour charts, pressure testers and what is known as the iodine test, are the three best known and used.

In the first place it must be recognised that such appliances are only of very limited value, as they all ignore the all-important fact that seldom does all the fruit on a tree attain the same degree of maturity at the same time.

The Colour Chart.

As the name indicates, these are charts based on a scientifically-determined standard for indicating by the change of ground colour just when an apple or pear reaches a particular stage of maturity.

Theoretically the method is quite sound, as the change in ground colour is one of the best methods of determining maturity, and hence colour charts can be of some limited value, especially to the small grower who harvests his crop himself. The limitations are obvious in respect to large areas, however, when one considers the fact that the average employee finds considerable difficulty in picking to size, without the added difficulty of discriminating between extremely slight shades of yellow or yellowish green. To the grower with little experience such charts can be a very real help.

The Penetrometer or Pressure Tester.

This is an instrument designed to measure in pounds per inch, the pressure required to force a plunger into the flesh of the apple or pear up to a certain depth. Its use is based on the theory that, as the fruit matures the flesh becomes less dense and thus more easily penetrable, therefore, registering less pounds per inch.

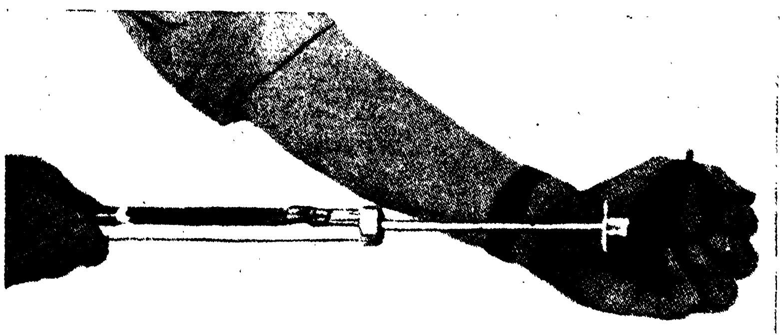
For scientific investigational work requiring exactness, these instruments no doubt are of value, but their practical value in large-scale apple and pear growing is limited to giving a vague indication as to when some of the fruit is at the required stage—picking then proceeding according to the visible resemblance of remaining fruits to the tested samples.

Their use requires some slight degree of experience, as it is possible at times to obtain varying readings on the one fruit according to the type of pressure exerted by the operator or the part of the apple tested.

The Iodine Test.

This is a test for maturity based on the fact that the starches in the immature apple gradually change to sugars as the fruit matures, and that a solution of iodide of potassium reacts on these starches but has no visible reaction in contact with the sugars. In practice, it has been found a reasonably reliable test with the Granny Smith variety and several others, but of no value in the case of pears and little value with other apples, notably Rome Beauty. Again only samples can be tested—commercial picking depending—as with the pressure tester—on visual resemblance to these samples.

A Pressure Tester.



The Grower's Experience is Most Valuable.

It is obvious then that all such mechanical aids to picking maturity can have only a very limited value, and that in the long run the grower has to depend on his employees for correct interpretation of any decision he may arrive at.

The experienced grower can usually arrive at his decision to pick without such aids—by closely observing the change in the ground colour and by testing the increasing crispness of the flesh and degree of sweetness and flavour apparent as maturity advances.

The date of harvestings in previous years is also a valuable guide, as, although one hears a lot about early seasons and late seasons, observations over many years indicate that in actual fact the period of any particular stage of picking maturity does not vary to any great extent, except as influenced by the size of crop.

The browning of the pips is often relied on as an indication of maturity, but by itself, is a very unreliable method, as in some seasons, particularly dry ones, the pips may be brown even weeks before the fruit is mature enough to harvest.

It is entirely natural for most fruits to fall from the tree of their own accord when a certain stage of maturity is reached, and thus the ease with which the apple or pear may be separated from its spur is also a guide as to time of picking. With coloured varieties also, the increased development of the characteristic colour of the variety is a further indication of advancing maturity.

All these simple tests, however, mean little to the novice, and as at the present time most picking staffs on the large orchards are composed, to some extent at least, of inexperienced men, then close supervision of picking by the grower himself or an experienced employee is called for.

Length of the Picking Period.

If the fruit is on the immature side, it may wither and never attain its full flavour, whilst if a trifle over-mature, it may develop various physiological disorders in store, besides breaking down quickly on removal.

With the mid-season varieties of apples and most pears it is seldom possible or desirable, unless the crop is very light, to strip the trees at one picking. At least two and frequently more pickings are necessary as a rule to obtain the bulk of the fruit at the optimum stage, and this is where experienced pickers are a great asset.

The late- and better-keeping sorts allow a little more latitude in respect of picking. Such varieties have a relatively long optimum picking period as compared to, say, Delicious and Jonathan, but, nevertheless, considerable marketing troubles have been caused in the past, mainly by over-maturity disorders caused by picking too late or holding too long in common store.

Apple Varieties which Need Special Care.

Three varieties in particular, by reason of their popularity and consequently the high prices usually ruling late in the season, call for particular comment. These are Granny Smith and Delicious apples and Packham pears. The comparatively long harvesting period of the Granny Smith precludes a great deal of trouble resulting from picking immaturely, as a rule, although in certain quarters there is a tendency to harvest earlier than is desirable in an effort to cater for the present day demand for green Grannies; the danger here is that dessert quality is being sacrificed for what is after all only a fad. The main troubles, however, experienced with Granny Smiths marketed late in the year are associated with over-maturity—in some instances due to late picking but more frequently due to over-prolonged common storage.

Provided the apples are reasonably mature when picked, this common storage period—even in the case of highland grown fruit—should be kept down to one or two weeks at the most, if the best results are to be expected.

Delicious is a good cool storage variety if handled correctly, but trouble is sometimes occasioned by both immature and over-mature picking. It has a relatively short optimum picking period as compared to Granny Smith, and fruit for any lengthy period of cool storage needs more careful selection, and on no account should it be common stored for even a matter of a few days. The September-November period represents long storage for this variety and there is a tendency—owing to the high prices usually ruling at that time for Delicious—to hold until this period, classes of fruit which are unsuitable for long storage and which should be disposed of by the end of the winter. In picking this variety for cool storage, it is particularly necessary to discriminate between fruit from young trees and grafts and lightly cropped trees, and fruit from older trees carrying a full crop. The former are not suitable for holding

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until the late spring, and should be picked and stored separately to facilitate early marketing.

Pear Varieties.

Packhams pears need special care in picking for cool storage. They are particularly subject to stalk-end shrivel and premature softening if picked immaturely. It is far safer with this variety to wait until the change in the ground colour is pronounced before picking. Two or more pickings need to be made to obtain the maximum quantity of fruit at the correct stage and, as with all pears, there should be no delay whatever in placing the pears in cool store once they are picked.

Citrus Stocks.

THE most widely used citrus stock is common or rough lemon, sometimes called "Citronelle." It has been used for very many years for most citrus varieties and its suitability over a widely varying range of soil types for the principal varieties of citrus fruit grown is very well established. This stock influences a very satisfactory and rapid development of most varieties budded on to it, and it is particularly suited to conditions which are frequently droughty for brief periods. Its weakness is susceptibility to root-rot under wet soil conditions, particularly when prolonged in a subsoil of a retentive character. Other features are that retention of good quality in fruit is brief, and with good growing conditions fruit quality tends to be rather gross.

No other commonly-used stock is any more resistant to injury from wet soil conditions, except *Poncirus trifoliata*, and this stock is not compatible with so many varieties. Consequently when it is desired to use rough lemon, conditions satisfactory to it must be provided.

Sweet orange stock does not appear to have any constant effect to indicate that it is preferable to rough lemon. Trees on sweet orange grow more slowly, especially if the soil is not the very best, and productivity is rather less influenced than by lemon. Better quality in fruit is retained perhaps a little longer, but that is insufficient advantage to warrant the use of sweet orange stock.

Seville orange, called "sour" in overseas countries, is a complete failure for orange varieties on the coast, and is erratic when used inland. It is more successful when used with lemon varieties in both areas.

The Value of *P. trifoliata*.

P. trifoliata is a very hardy deciduous stock which for many years has been increasingly demonstrating its value for other citrus varieties than lemons. Many navel, mandarin and grapefruit varieties, however, fail to grow into large productive trees on this stock. Hence care is necessary to use it only where benefit may result. It is a desirable stock because of its influence on the quality of fruit, and longer retention of

Twenty-five-year-old Valencia Orchard (on left) growing in a Low Situation at Wyong.

Note levee bank and gate to keep out flood waters. All trees are on *P. Trifoliata*.

that character, together with its much greater immunity to root-rots.

It is particularly valuable with Late Valencia orange and Ellendale Beauty mandarin. It is considered suitable for grapefruit varieties because of its effect on quality; but with Marsh variety and Navel oranges, too, a proportion of trees are likely to develop poorly. The beneficial influence on Marsh, however, compensates for the poor development of some trees of that variety.

Mandarins, such as Emperor, are also favourably influenced in quality, but as fruit size is somewhat smaller, Emperor on *trifoliata* is only desirable in soil types where fruit size is readily attained. Rapid loss of juice and "puffiness" are minimised by the influence of this stock.

As *trifoliata* stock is immune to phytophthora root-rot, which is induced by wet soil conditions, its use should be given preferential consideration by growers on irrigated areas.

Mushroom Growing.

Recent Development as a Specialised Industry.

SINCE the introduction of pure culture methods of spawn production by the Department of Agriculture in 1931, there has been a gradual and substantial development of mushroom growing in the vicinity of Sydney. The earlier ventures in mushroom growing were confined to tunnels, sheds, cellars, etc.—that is, the mushrooms were grown under cover. Within the last four or five years, however, the outdoor ridge bed method of mushroom growing has increased to such an extent that more mushrooms are now produced in this State by this system than by that originally employed. Most of the culivated mushrooms produced are now grown in the area between Parramatta, Blacktown, St. Mary's, Riverstone and Windsor, with the major concentration at Oakville and Maralya, in the Windsor district.

In the Oakville-Maralya section, prior to the development of mushroom growing there, the main source of income in most cases was poultry farming, with fruit and vegetable growing as subsidiaries. To-day the main source of income is mushroom growing, and in several cases it has become a whole time industry. The larger growers handle up to 10,000 square feet of bed, but areas over 5,000 square feet usually require the employment of additional labour.

Owing to the difficulty of controlling insect pests in outdoor ridge bed culture, this type of mushroom growing is more limited to the cooler months of the year than is the case with mushrooms grown in sheds and tunnels. Build up of fungous diseases and weed fungi is kept in check at Oakville and Maralya by placing the beds in a new site each season.

In recent survey of ridge beds in this area no definite evidence was found of any parasitic fungal diseases or weed fungi. The main troubles experienced by growers were related to faulty preparation of compost and watering problems. Earlier in the season many growers had experienced a condition known as "white gill," in which the mushrooms are small in size and the gills show only a trace of pink or are almost white. The cause of white gill is not known, although it is thought that it may represent an abnormal strain characteristic.

The various aspects of mushroom growing are fully discussed in a 34-page illustrated pamphlet entitled "Mushroom Culture," obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.—BIOLOGICAL BRANCH.

Goulburn Country Killing Works.

Minister Lays Foundation Stone.

The Minister for Agriculture (Hon. E. H. Graham, M.L.A.) recently laid the foundation stone for the Goulburn Country Killing Works, thus bringing into actual fact a project that was first mentioned as far back as 1868.

Country killing works are also to be established at Wagga, Dubbo and Gunnedah, under the State Government's policy of decentralising the slaughtering of stock.

"The four country killing works," said Mr. Graham, will complete a chain of plants for the treatment of stock in country areas that will enable stock to be slaughtered within twenty-four hours of leaving their home pastures, thus retaining the bloom that is essential for high quality. Farmers will be able to see the carcases on the hook and be able to quickly learn the type and quality of carcase that must be produced if we are to capture and retain our export markets.

"The works will be controlled by the local governing authorities and are being constructed under a very generous scheme of financial assistance from the State Government."

REDUCING THE MUD NUISANCE ON DAIRY FARMS

By the Use of Concrete Strips.

I. W. SCOTT, H.D.A., H.D.D., Special Dairy Officer.

MANY of our dairy farms are not blessed with sandy, absorbent or rocky surroundings to the dairy premises and suffer severely in wet weather from the mud nuisance. It is not unusual to see the small receiving yard and exit surroundings of bails churned to a veritable quagmire, with cows expending much energy pulling themselves through it. Many small yards and the bail exits have been concreted, but this only puts the evil a little further away without reducing it.

New Zealand and Victoria have shown the way in the development of concrete strips leading from the dairy, and it is not unusual to see these strips leading out hundreds of feet from the bails to the various paddocks, with the result that in place of the usual mud area round the bails, pasture often extends right up to the bails.

The legacy that mud brings with it—dirty bails and dairy, heavier task of washing udders, sore and cracked teats, footrot and inferior quality milk and cream, as well as frayed tempers of the individual—renders worthwhile consideration of any means that will abate the nuisance in wet weather.

Properly laid out, with due regard to future extension, concrete strips form an asset worth many times the cash outlay in the advantages derived.

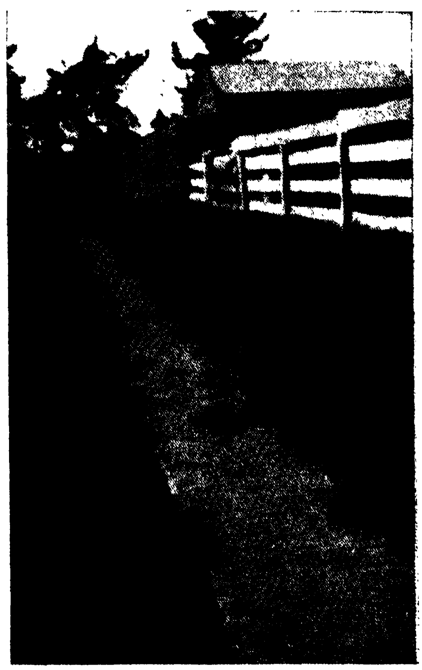
The accompanying illustration shows one of the strips seen on a Victorian farm. This strip is 18 inches wide and 2 inches thick, constructed of 3 x 1 river gravel with a 1-inch corrugation.

Writing in the *Victorian Journal of Agriculture* about these concrete strips, Messrs. Mahoney and Crowley, Victorian Supervisors, stated:—

"Some dairymen have tackled the problem by laying down slabs or squares of concrete at inlets and exits, but have found that where the cows stepped off the concrete the mud was as deep as ever. Even fairly large areas of concrete laid in this fashion have failed to improve the position, and this has led many farmers to say, in effect, 'No matter how far you take the concrete, there will be mud where the cows step off.'

"Most farmers believe this to be true, but the experience of Messrs. Best and Carter of Yarragon does not support their belief. These farmers are dairying on heavy grey-soil flats, with an annual rainfall of 40 inches. Four years ago 2½ acres of mud surrounded their dairying premises, and another area was so soiled by mud that it was useless as pasture. At an unimproved value of £60 per acre this muddy area represented £150 worth of land lying idle, and a loss of £30 per year in carrying capacity. At the present time (October, 1942), despite the fact that sixty-five cows have been milked throughout the past winter, there is no mud to speak of at any period of the year.

"This transformation has been achieved by laying down many chains of concrete



A Concrete Strip 18 inches Wide by 2 inches Thick on a Victorian Dairy Farm.

tracks radiating from the dairying premises. Near the yard, where traffic is heavy, parallel tracks about 10 feet apart have been laid, while drinking troughs have been encircled with concrete. In all, 800 yards of tracks have been laid down, and proved such a sound investment that they are still being extended.

"The benefits to be derived from a system of concrete tracks are so great that it would seem, even if it were necessary to borrow money to carry out the project, that it would be a sound business proposition to do so. Extra pasturage would be obtained, time would be saved, there would be lower herd wastage, and what is an important consideration, working conditions would be improved.

"It is not suggested that the ideal conditions aimed at by Messrs. Best and Carter are within the financial reach of the average farmer, but this should not discourage him from carrying out improvements on a modified scale."

In the article the authors proceeded to discuss the successful use of concrete tracks on several other properties. On one of these they record that the mixture used was 4 parts metal, 3 parts sand, and 1 part cement, laid from 3 to 4 inches thick, according to the nature of the ground. The width of the tracks was about 22 inches, although angles and approaches to gateways were winged to provide greater width, and the edges were rounded.

It was emphasised that, apart from the economy of material, the reason for the narrow track was to prevent the "boss" cow from turning round to drive another cow off the track.

In two of the cases referred to, the tracks led to the cowyard entrance. The route of the cows after milking, then, was along the exit track from the bails, back to the tracks, and so to the paddock. This plan, they said, should be followed in all cases where possible, as it gave double use of tracks, and consequently double value for the money spent. It was desirable that twin tracks should be laid through gateways. Although 22 inches was given as the width of paths in the above cases, many farmers had found that tracks as narrow as 17 inches had proved quite satisfactory.

In some cases, where a track was laid in one continuous strip and not in sections, old fencing wire, either barbed, plain or netting, had been used for reinforcement. Two or three strands were placed along the prepared bed and the concrete deposited on it.

Toxaemic Jaundice.

Measures Recommended to Sheepowners.

TOXAEMIC jaundice in sheep, from which serious losses occur from time to time, has been the subject of investigation by a Joint Committee of the C.S.I.R. and the New South Wales and Victorian Departments of Agriculture for a number of years. There is still much to be learnt about the disease, but it is nevertheless possible to indicate steps by which sheepowners may guard against its occurrence in their flocks, and at least reduce its incidence.

In its report for 1946-47 the Committee makes the following recommendations:—

1. Maintain sheep as far as possible on a pasture in which grasses predominate. Pasture management should be calculated to favour grasses in the pasture.

2. In seasons with abundant early autumn rains sheep should not be grazed on clover-dominant pastures in those areas where toxaemic jaundice is known or suspected to occur. They can be grazed on the clover with greater safety after the plant has flowered.

3. A salt lick containing molybdenum can be used with caution. Not all the sheep will take the lick, and some will take more than may be good for them. The lick need not be use continuously throughout the year, but may be made available during summer and autumn.

A suitable lick can be prepared as follows: Take a bag of salt (187 lb.) and empty on to a mixing floor. Take 10 oz. ammonium molybdinate and dissolve in 2 gallons pure water. Sprinkle the solution on the salt and mix very thoroughly.

4. **When the flock has acquired a high copper status deaths are precipitated by any nutritional strain and by exertion. In these circumstances mortality can be reduced by maintaining a reasonably high level of nutrition and by keeping the animals as quiet as possible.**

Apiary Notes.

The Migration to Gundagai.

Problems of Foul Brood and Working Paterson's Curse.

D. L. MORISON, B.V.Sc., Apiary Branch.

DURING part of October, I was in the Gundagai district, and in a position to make some further observations on American Foul Brood disease of bees. I had also an opportunity of observing the working of the Paterson's Curse flow by what was probably one of the heaviest concentrations of apiaries in the history of New South Wales beekeeping.

It has been the case in the past that whenever large numbers of colonies have been moved into a district, most of them have been centred near a town, and once again in this instance, the same procedure was adopted. Most of the bees were placed, near Gundagai, on the main road, even though there was plenty of similar country further west completely unstocked.

Apparently some beekeepers still prefer to have the convenience of being near to a town than to consider the welfare of their bees by placing them to the best advantage on relatively unstocked country. Some of the beekeepers who migrated to Gundagai were not quite so happy about the proximity of other apiaries when it was discovered that several large apiaries in the district were lightly infected with American Foul Brood.

American Foul Brood.

While at Gundagai, I gave a lecture and demonstration on American Foul Brood. Samples of infected brood, from an apiary in the locality, were available for demonstration purposes. The following aspects of the disease were discussed: Cause, symptoms, differential diagnosis, distribution, spread within the apiary and from apiary to apiary, methods of avoiding and preventing spread of the disease.

Notification and Compensation.

The Department requires that an outbreak of disease must be reported at the earliest opportunity. There is a compensation scheme, under which beekeepers are compensated to the extent of two-thirds of the value of material destroyed *under direction of an Apiary Inspector.*

Treatment.

At present it is not considered that the saving of bees is desirable. They are usually killed with cyanogas or petrol and burnt, together with all the hive contents. If the covers, bottom boards and hive-bodies are worth saving, the beekeeper is allowed to retain them, provided he boils them for half an hour in 1 per cent. caustic soda solution.

Recognition of the Disease is Vital.

Beekeepers must be able to recognise the disease so that they can report its presence in their apiaries and take immediate action to limit its spread.

Moreover, the beekeeper must himself be responsible for check-inspecting his apiary at regular intervals for any possible fresh cases of American Foul Brood. The staff position of the Apiary Branch does not, at present, allow of the regular inspection of all American Foul Brood infected apiaries at frequent intervals in order to make certain that all residual infection has been eliminated.

Reasons for Persistence of Infection.

From the Gundagai and other recent inspections, it has been deduced that Foul Brood is tending to persist in certain apiaries for the following reasons:—

1. *Ignorance on the part of the beekeeper* as to the exact symptoms and nature of

the disease, so that some lightly infected colonies are allowed to remain and perpetuate the disease in the apiary. It has been my usual experience to find an additional 50 per cent. of infected colonies in an American Foul Brood infected apiary which has already been inspected by the beekeeper himself.

2. *Certain beekeepers have more bees than they can adequately care for.* This position has been rendered more acute in recent years by the almost entire lack of skilled labour for employment in apiary work. The examination of brood when looking for symptoms of American Foul Brood must be very thorough, if the disease is to be eradicated, especially if the "one-cell colonies" so typical of secondary infection in large commercial apiaries are to be eliminated. It is these latter colonies, which may only be showing one or two infected cells of brood, that are a major factor in causing the disease to crop up in an apiary year after year, since the disease progresses in these hives, from which it may spread. The beekeeper notices nothing until the disease becomes self-evident and cannot be ignored.

3. *Some beekeepers are careless* and may neglect to inspect all colonies, or insufficiently sterilize infected material or otherwise allow a residue of spores to remain in the apiary, with the result that they have cases of foul brood cropping up every spring.

4. *Treatment of bees infected with American Foul Brood by such methods as placing them in clean material on foundation.* This is not recommended, since infection has been known to recur in such colonies, often after some considerable time.

Some beekeepers seem inclined to regard American Foul Brood very lightly, and this is a very dangerous attitude which may lead to the loss of their apiaries. A few beekeepers have even said that American Foul Brood is easy to clean up. However, it seems likely that in such instances some other minor condition of brood which has been easily got rid of has been mistaken for American Foul Brood. It is again emphasised that American Foul Brood will not cure itself, but must be systematically eradicated from an apiary. This may involve a considerable amount of detailed examination, which, however, must be done. To disregard this advice is to bring added trouble in the future.

Paterson's Curse or Blue Weed.

The Gundagai trip also enabled me to make observations on the working of a flow from Paterson's Curse (*Echium plantagineum*) which, in a lush season such as the present one, is the dominant plant on many square miles of country in New South Wales.

Paterson's Curse, which is native to the Mediterranean region and Western Europe, was first introduced into New South Wales at Albury, and was named after a certain Paterson, from whose garden it is supposed to have escaped. Since then, it has spread to pasture in many of the better-class inland districts of New South Wales, including Gundagai, Coolac, Jugiong, Cootamundra, Young, Bathurst, Dubbo, Gilgandra and Inverell. It occurs in the wheat crops in some areas and has been spread to new districts in agricultural seed.

This plant is an annual or biennial, which forms a flat rosette of rather broad hairy leaves during the late autumn and early winter. In the spring, flower stalks grow up from this rosette. The inflorescence is of a racemose type, *i.e.,* it has a growing tip from which successive flowers are formed, the older ones dying off as the younger ones develop. This gives the "Curse" a fairly lengthy flowering period, and under favourable conditions, it will bloom from early October to the middle of December.

The Utility of Paterson's Curse.

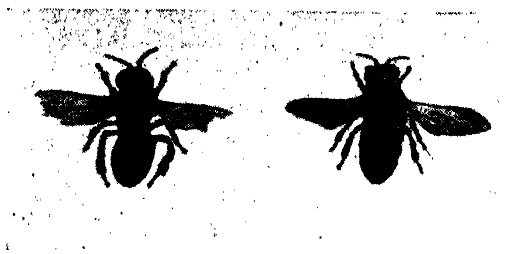
From the viewpoint of the grazier, Paterson's Curse is rather undesirable. The plants are eaten by stock when young, but as they mature, they become very harsh and unpalatable and are very difficult to burn when dry.

However, the beekeeper's opinion of Paterson's Curse is rather different, for it not only provides a profuse supply of pollen, but is an excellent source of nectar as well.

The pollen derived from "Curse" is of a deep purple colour, and as is common with most other ground flora, the pollen is of

a high quality, promoting prolific brood-rearing at a time when it is most advantageous (*i.e.*, during the spring).

The honey produced by bees working a flow from "Curse" is of excellent colour and flavour, but lacks density, owing to the fact that beekeepers usually extract the honey a little on the "green" side when working this flow, to assist in swarm control which is rather a problem to the beekeeper during the "Curse" flow. A yield of two tins per hive has been obtained from the "Curse" during a good season, so that it is often a commercial source of honey.



Left.—Bee with Frayed Wings as the Result of Working Paterson's Curse Flowers.
Right.—Bee with Normal, Undamaged Wings.

Like most other ground flora, Paterson's Curse is very much affected by weather conditions. Good rains during the autumn and winter help to promote growth, while hot humid conditions during the blooming period favour maximum secretion of nectar.

Some beekeepers have observed that the "Curse" yields heaviest towards the end of its blooming period, much the same as White clover behaves on the North Coast of New South Wales. This is doubtless due to the fact that temperatures are fairly low when the "Curse" starts to bloom in the spring and this retards secretion of nectar. As the summer advances, temperatures are higher and secretion may become profuse.

During the early part of the season, temperature changes may cause fluctuations in nectar yield from day to day, with the result that the bees are often rather vicious on "Curse" at this period.

An Undesirable Feature.

One undesirable feature of the Paterson's Curse is that bees working it damage their wings rather severely. The wing-tips become frayed out very quickly, with the result that the bees' working life is reduced.

One beekeeper has expressed the opinion that this fraying is due to the bees flying through the harsh plants and beating their wings against the projecting hairs. While this may partly be the cause, close observation has suggested that the structure of the flower may also be a cause of injury.

The young, partly opened flower of Paterson's Curse has the lip of the corolla (flower tube) turned markedly downwards and slightly inwards. When a bee enters such a bloom it has to crawl right inside to reach the nectar. When backing out it catches its wings on the inturned lip of the corolla, and it is thought that this action may contribute to the fraying of the bee's wings. When the corolla of the flower becomes completely expanded, the lip is turned outwards and cannot then catch the bee's wings.

Flowers of Paterson's Curse.
Top.—Unopened Bud.
Centre.—Partially-opened Flower, showing Hooked Corolla.
Bottom.—Fully Opened Flower.

However, Paterson's Curse is a promotor of such prolific brood-rearing that the damaged bees are quickly replaced, and the disadvantage described above would certainly not dissuade the average beekeeper from working a flow from this source.

B.H.C. (BENZINE HEXACHLORIDE) AS A BLOWFLY DRESSING.

G. J. SHANAHAN, B.Sc.Agr. and F. MORLEY, B.V.Sc., H.D.A.

THE search for improved blowfly dressings was given a fresh impetus following the recognition, in recent years, of the insecticidal properties of D.D.T. and "B.H.C." Comments on the probable effect of the incorporation of D.D.T. in blowfly dressings have been made by Waterhouse[1] (1947).

The present article refers to preliminary work at Trangie Experiment Farm with a B.H.C. emulsion as a blowfly dressing during the autumn of 1947. In addition, brief reference is made to tests which were commenced this spring at the Farm with various blowfly formulations containing B.H.C.

When laboratory tests demonstrated the contact toxicity of B.H.C. to blowfly maggots (Shanahan[2] 1946), experiments were conducted to determine the residual toxicity of the chemical in wool on sheep. Briefly, it was found that wool from sheep, which had been treated with B.H.C. emulsion as low as 0.3 per cent. concentration, was toxic to old maggots of *Lucilia cuprina*, the primary sheep blowfly in Australia, six to eight weeks following treatment. (Shanahan unpublished.)

An Experiment at Trangie Experiment Farm.

Further information on the value of B.H.C. as a blowfly dressing was obtained by treating strikes with 1.0 per cent. B.H.C.-xylol* emulsion. The emulsion contained approximately 2.0 per cent. xylol and was used with soft water. In this work, which was conducted with ewes at Trangie Experiment Farm, 18 breech strikes were treated during April, 1947, when the blowflies were moderately active. The strikes were treated with the emulsion without removal of the wool. In treating the strikes an effort was made to saturate the wool on the actual strike and surrounding it for a distance of 2 to 3 inches. This method of treatment subjected the chemical to a rigorous test, as the wool usually contained exudate in which restrike could normally occur. It would be unsuitable for general use.

Two restrikes occurred within fourteen days. One restrike appeared away from the original strike. It was, therefore, possible that this was not a case of being restruck on the treated area. The other restrike developed on a ewe with a very wrinkled breech. This sheep had a very severe initial strike.

The results from the autumn tests gave some evidence that B.H.C. as a blowfly dressing, could prevent restrike. All maggots which were contacted by the B.H.C. emulsion in a strike became agitated within seconds of the application. Actually a similar result is obtained when a 2.0 per cent. xylol emulsion is worked into a strike without removal of the wool. Whilst both emulsions appear to kill young maggots, no information is available on the survival rate of the old maggots, which usually left the sheep within 10 minutes of treatment. However, one-minute immersion tests with 1.0 per cent. B.H.C.-xylol emulsion showed that a high survival rate occurred.

Experience with the Spring Fly Wave.

During the severe fly wave which was experienced at Trangie this spring, approximately 200 strikes were treated with various B.H.C. preparations. Whilst these tests are incomplete, a notable feature of the work has been the virtual freedom from restrike. In addition, 31 mild to moderate head strikes on rams were recently treated with 1.0 per cent. emulsion of B.H.C. and restrike did not occur.

Observations.

The results from the tests with 1.0 per cent. B.H.C. emulsion indicate that this formulation will free the strike of maggots and prevent restrike. It must be emphasised, however, that a 1.0 per cent. B.H.C.-xylol emulsion in itself would not be a good blowfly dressing, for it does not give a

(Continued on page 672.)

* Benzene hexachloride, 13 per cent. gamma isomer.

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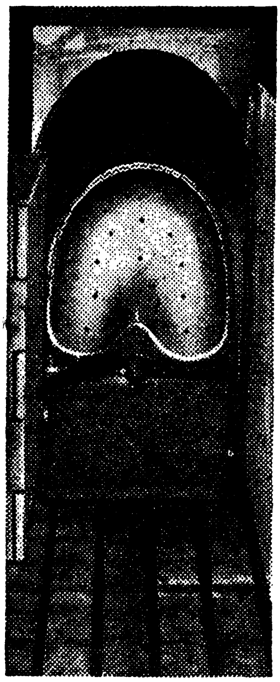

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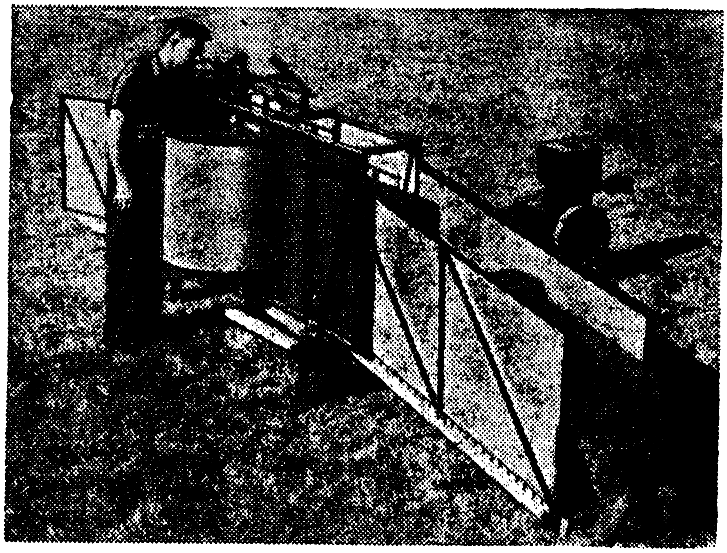

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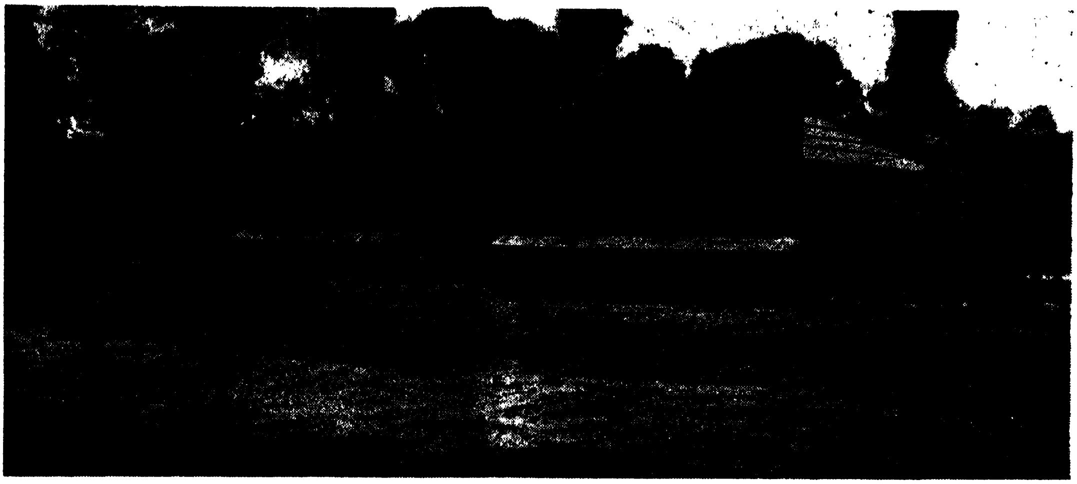


Poultry Notes.

E. HADLINGTON, Principal Livestock Officer (Poultry).

CARE OF EGGS.

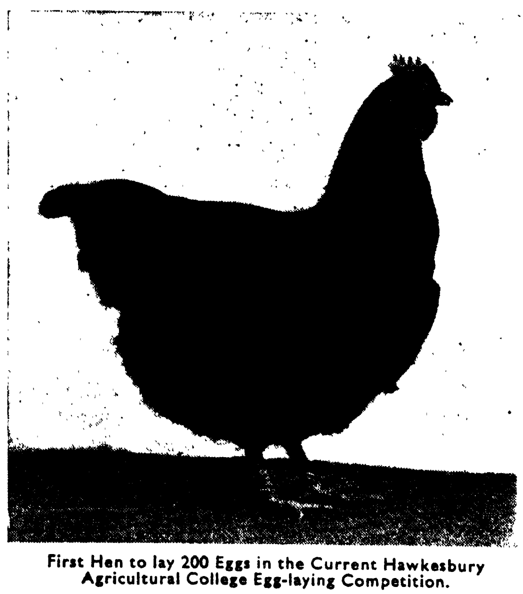
REFERENCE has been made in these Notes from time to time to the necessity for careful handling of eggs in order to maintain the highest quality possible. With the approach of summer weather, it is particularly important that the greatest care be exercised in handling eggs through all the various stages from the time they are laid till they reach the consumer.

The producer, however, is primarily concerned with their care on the farm and in transit to market. It is desired to direct attention again this month to a few of the most important factors in the handling of eggs to maintain their quality.

Nests and Nesting Material.

The first consideration is to see that sufficient nests are provided to avoid overcrowding, and it is generally agreed that one nest to each five hens is necessary. If the nests are divided into compartments, each nest should be about 13 inches long by 9½ inches to 10 inches wide and 6 to 7 inches deep. It is important that there should be sufficient space between the divisions and the top of the nest to permit of the birds moving from one nest to another when several try to get into one nest.

Where undivided nests are used, the length should be equivalent to the measurements outlined above, but with this type of nest the tendency is for the hens to lay in one end and there is more risk of the bottom of the nests becoming bare. The nests should not be exposed to strong light as the birds prefer a darkened nest.



First Hen to lay 200 Eggs in the Current Hawkesbury Agricultural College Egg-laying Competition.

This hen, the property of Messrs. C. A. Clark and Son, laid the 200th egg on 18th November (232 days), and wins for her owners the Poultry Newspaper Trophy of £2/2/-.

It is important that the nests be provided with suitable nesting material to a depth of not less than 3 inches so that the eggs do not come in contact with the bottom of the nest. Clean, coarse river sand or shell-grit covered with a layer of rice hulls or fine straw, makes a satisfactory nesting material, as the sand or grit are not as easily scratched out as in the case of straw or rice hulls alone.

Collecting the Eggs.

The eggs should be collected not less than twice daily. The advantage of this practice is that less soiling occurs and broody hens do not sit on the eggs for any length of time. Moreover the eggs can be cooled more quickly when they are removed from the nest.

Keeping the Eggs Clean.

Apart from the fact that dirty eggs create more work in cleaning, they are also more likely to be infected with bacteria than clean ones. The first step in avoiding dirty eggs is to keep the houses reasonably clean, as well as the nests, and if a supply of rice hulls is kept handy, the surface of the nests can be raked off as the covering material becomes soiled and can be replaced with a handfull of clean hulls.

Soiling of the nests frequently occurs through the birds roosting in them at night; therefore the fitting of a closing device is advisable.

Storing the Eggs.

The storage of eggs on many farms leaves much to be desired, and every effort should be made to provide suitable storage accommodation so that the eggs can be cooled down as soon as possible after collection.

Separation of the Male Birds.

During the hot weather fertile eggs deteriorate more rapidly than those which are infertile. It is therefore advisable to remove the male birds from pens.

Preventing Breakages.

Some of the common causes of cracked eggs are unsuitable collecting tins or buckets and placing too many eggs in the one container. To prevent breakages the collecting buckets should be strong enough to prevent any movement in the sides when full and a soft pad should be placed in the bottom of the bucket.

Cleaning Eggs.

The cleaning of eggs should only be carried out when they are excessively dirty; and if they have to be washed, the washing should not be done until 5 or 6 hours after they are laid. The water used for washing should not have a lower temperature than the eggs themselves and the washing should be done under strictly hygienic conditions, care being taken that the eggs are not allowed to soak in the water for any length of time.

Packing the Eggs.

Much can be done towards preventing breakages when packing the eggs and the main points to be observed are as follows:—

(*a*) A suitable pad should be placed in the bottom of the boxes and also on the top after placing the last flat in position; and if there is any undue play at the sides of the fillers, the spaces should be filled with a little crumpled paper or woodwool.

(*b*) All eggs should be packed with the small end downwards.

(*c*) No eggs should be wedged tightly in the fillers.

(*d*) No long eggs should be packed if the ends stand above the top of the fillers.

(*e*) Large eggs should be packed in the corners of the fillers.

(*f*) The fillers should be dry and clean.

(*g*) The lids of the cases should be fastened securely.

Marketing Eggs.

Eggs should be marketed at least twice per week in the summertime, as this has a most important bearing upon quality. Where twice a week marketing is not being carried out an effort should be made to do it. It cannot be expected that eggs marketed only once each week in the hot weather will be classified as first quality.

Transport of Eggs.

Particular care should be taken that eggs are not allowed to stand in the sun, wind or rain awaiting the carrier to pick them up. Eggs standing in the sun on a hot day for an hour or so will rapidly deteriorate in quality and this might often be responsible for second quality classification.

The Carrier's Part.

In many instances eggs are allowed to stand in the sun on the carrier's lorry and under such conditions deterioration is inevitable, especially if the load is not covered with a tarpaulin. It is, of course, difficult to overcome this in some instances but every effort should be made to keep the loads in the shade when standing.

Feather Picking and Cannibalism.

THESE troublesome vices are frequently observed among chickens and adult birds, and cannibalism is often responsible for heavy losses if the cause is not quickly ascertained and removed.

Some of the main causes of an outbreak of both feather picking and cannibalism among adult birds are overcrowding, too close confinement, perches too close, nests too exposed, inadequate scratching material (particularly in intensive houses) and deficiencies in the diet.

A Typical Case of Feather Picking.

In the case of chickens common causes are close confinement, overcrowding, badly ventilated brooders, deficiencies in the ration and rays of sunlight shining on the brooder or brooder house floor, causing the chickens to congregate and pick each other's toes or tails on account of the veins and quills being shown up by the strong light.

Remedial Measures.

It is significant that where chickens and adult birds have ample house and yard room and growing stock are allowed free range there is seldom any trouble with these vices. Therefore, when any trouble is observed the first consideration is to see that the house and run accommodation are satisfactory and then check up on the ration. Deficiencies which are likely to be responsible are salt, protein, and in some cases a low fibre content. Shortage of green feed might also be a contributing cause.

In the case of chickens the mash should contain not less than 1 per cent. of salt (and this may be increased to 1½ per cent. if care is exercised in mixing), and the protein content of the whole ration should not be less than 18 per cent. This may also be increased when cannibalism makes its appearance.

If the ration is low in fibre the addition of 15 to 25 per cent. of ground oats to the mash may remedy the trouble. American poultry nutrition workers have advocated the use of ground oats to check either cannibalism or feather picking, but no extensive work on this subject has been carried out here.

When cannibalism occurs among chickens, painting the affected parts with stockholm tar or even bootpolish will assist in saving the victims from further onslaughts.

For adult birds the salt content should be the same as for chickens, but a somewhat

lower percentage of protein is usually satisfactory—approximately 14 per cent. being adequate. However, a temporary increase may be beneficial when feather picking or cannibalism occurs. Finely ground oats might be added to the mash to the extent of 25 per cent., and a similar percentage of whole oats in the grain feed.

Indications of Feather Picking.

Feather picking usually commences around the abdomen and tail but in the advanced stages the feathers around the neck and thighs are frequently broken off. The first indication of the trouble is that the feathers become somewhat stripped, and later they are broken off until finally the affected parts are completely denuded of feathers.

Feather picking often commences before the pullets come into production, and gradually extends until the birds have the appearance of moulting. In fact, many inexperienced poultry keepers have attributed this condition to a moult.

Development of Cannibalism.

Egg production does not appear to be affected by feather picking and the birds are usually in good health, but there is always a risk of cannibalism developing when the abdomen is picked bare of feathers. This occurs through the birds picking the flesh, and when blood is drawn the others join in and soon kill the victim by picking out the internal organs.

In some instances cannibalism is confused with protrusion of the oviduct, but where feather picking is prevalent and "pickouts" occur, cannibalism should be suspected. Cases of protrusion can be distinguished, if observed early enough, by the everted cloaca, but if affected birds are not removed quickly the others will often attack them and evisceration will result in a short time.

When feather picking is prevalent or cases of protrusion are noticed, particular attention should be given to the nests to ensure that they are not exposed to the light, thus encouraging the birds to pick those about to lay. Other precautions which should be taken are to see that the alighting board for the nests is not close enough to permit of picking the birds when they have laid, and that the nests are deep enough to hide the laying birds.

Egg Weights in 1947-48 Egg-laying Competition at Hawkesbury Agricultural College, Richmond.

THE weighing of eggs in the current Hawkesbury Agricultural College Egg-laying Competition, was completed at the end of October and the results show a further improvement, the number of birds disqualified for under-weight eggs being less than last year.

The method at present adopted for arriving at the weight of eggs is to take the number of eggs laid between the 1st and 31st of August, but in the case of birds which do not lay twelve eggs in that period, the weight is taken to the first twelve eggs laid from 1st August to 31st October, and any bird other than a replacement which fails to lay twelve eggs in that time is disqualified for prizes. Where birds are replaced after 1st August, the first twelve eggs laid are weighed, provided that this number is laid in ninety days; otherwise such birds are disqualified.

The eggs weights this year, compared with those of last year, are shown hereunder:—

Birds Laying Underweight Eggs.

1947-48—

- Light Breeds—16 Individuals = 5.33 per cent.
- Light Breeds—6 Groups = 12.0 per cent.
- Heavy Breeds—9 Individuals = 3.75 per cent.
- Heavy Breeds—4 Groups = 10.0 per cent.

1946-47—

- Light Breeds—25 Individuals = 6.9 per cent.
- Light Breeds—9 Groups = 15.0 per cent.

Heavy Breeds—19 Individuals = 10.5 per cent.

Heavy Breeds—5 Groups = 16.6 per cent.

The figures for this year show a very satisfactory position, especially considering that six individual birds did not lay the required number of eggs during the laying period.

A complete list of the individual egg weights, and the averages for the groups is given below.

AVERAGE EGG WEIGHTS.—1947-48 EGG-LAYING COMPETITION.

Competitor.	Individual Birds.						Group.
			Australorps.				
Becroft, C. C.	25.3	27.0	26.4	24.7	26.2	26.1	25.9
Bevan, P.	25.8	26.5	29.3	28.2	27.4	27.5	27.4
Broadbent, J.	26.0	24.6	25.9	26.2	25.9	25.4	25.7
Campbell & Kinnish ...	26.7	25.5	25.7	27.8	27.4	24.9	26.3
Carroll, J. L.	25.7	27.6	26.0	25.0	29.3	27.1	26.8
Clark, C. A. & Son (S) ...	27.7	28.1	27.9	24.6	25.5	26.9	26.8
Copus, W. J.	25.4	24.7	27.2	27.2	25.7	26.1	26.1
Devonshire Pty. Farm ...	24.1	26.7	26.8	27.4	25.3	27.5	26.3
Fitzsimmons, E.	26.5	26.5	28.3	26.4	26.5	29.6	27.3
Goodridge, W. J. ...	26.2	24.5	26.7	27.7	26.2	25.3	26.1
Greenwood Bros. ...	26.7	26.9	25.3	25.5	27.5	27.8	26.6
Hawkins, V. H.	25.2	24.6	24.8	25.8	27.0	26.3	25.6
Henderson, R. B. ...	26.8	25.7	26.9	25.3	25.4	*a*23.9	25.7
Judson, N. F.	25.0	26.9	27.1	26.0	27.7	28.9	26.9
Kennedy, F. J. (S) ...	28.5	28.3	26.7	28.6	25.0	24.6	26.9
Kingsdale Pty. Farm ...	26.8	27.3	26.9	25.5	26.5	29.0	27.0
Martin, S.	26.7	26.3	29.0	26.7	27.3	28.9	27.5
Minegold Pty. Farm ...	26.4	24.7	*a*20.7	26.8	27.0	28.5	*a*25.7
McDonald, T.	29.3	26.0	27.6	28.6	26.5	24.8	27.1
Newton, R.	25.8	25.7	27.2	26.5	26.9	26.6	26.5
Paull, R. W.	25.4	25.5	25.3	29.2	27.2	25.7	26.4
Ramsden, D. H.	25.7	26.8	24.9	28.2	25.9	25.9	26.2
Smith, N. F.	24.1	*a*23.9	24.0	24.9	*a*23.4	24.3	*a*24.1
Southern, J.	28.9	27.7	26.5	29.7	25.3	24.5	27.1
Sproule, F. E.	26.5	24.6	27.1	26.6	24.5	25.0	25.7
Tyson Bros.	25.4	25.8	25.4	24.1	26.7	24.1	25.3
Wighton, W. T.	25.6	24.3	24.8	28.8	25.2	25.0	25.6
			Rhode Island Reds.				
Baird, J.	29.6	25.4	29.1	28.2	27.9	27.9	28.0
Davina Pty. Farm ...	25.5	23.2	26.6	*b*	26.9	24.8	*a*
Finney, F. P.	28.5	27.2	29.3	29.1	27.7	28.3	28.4
Hirst, C. H.	26.4	28.0	25.1	25.3	27.3	*b*	*a*
Madrers, Mrs. C. E. ...	26.3	26.2	27.0	26.0	26.4	26.4	26.4
Wheatley, G. H.	*a*23.8	26.4	28.0	26.8	25.8	27.1	26.5
			Langshans.				
Brown, W. T.	25.6	27.9	27.4	26.0	28.2	25.5	26.8
Harris, R. F.	26.4	26.5	26.2	28.3	25.4	28.3	26.9
Hooker, P. J.	27.3	*a*23.4	27.1	27.1	24.0	24.5	25.6
Meller, J. E.	25.1	26.8	27.1	27.1	27.4	26.8	26.7
Moyes, T. R.	26.9	28.8	25.9	27.9	26.7	27.8	27.3
Nicholls, S.	24.9	27.1	26.5	27.4	25.9	25.1	26.2
Wilson, R. D.	*a*23.8	24.1	29.0	25.3	26.2	25.7	25.7
			White Leghorns.				
Alder, G.	24.5	24.7	24.5	25.1	24.6	25.2	24.8
Anderson, W. & N. ...	27.7	28.5	27.5	24.1	25.7	27.6	26.9
Argall, W. F.	25.7	24.9	26.3	25.9	24.9	27.1	25.8
Baird, C. W.	26.0	24.3	26.9	25.9	26.6	24.7	25.7

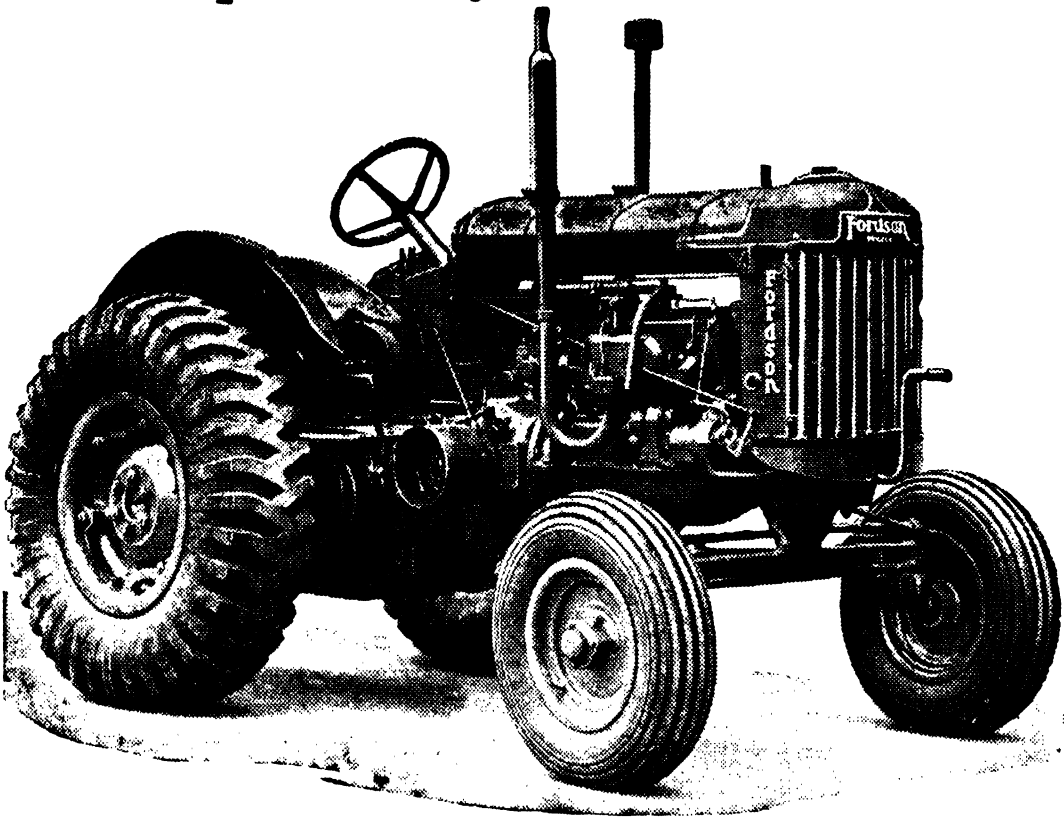
a Indicates bird ineligible for prizes owing to non-fulfilment of egg weight conditions.
b Indicates bird failed to lay required number of eggs during weighing period.

AVERAGE EGG WEIGHTS.—1947–48 EGG-LAYING COMPETITION—*continued.*

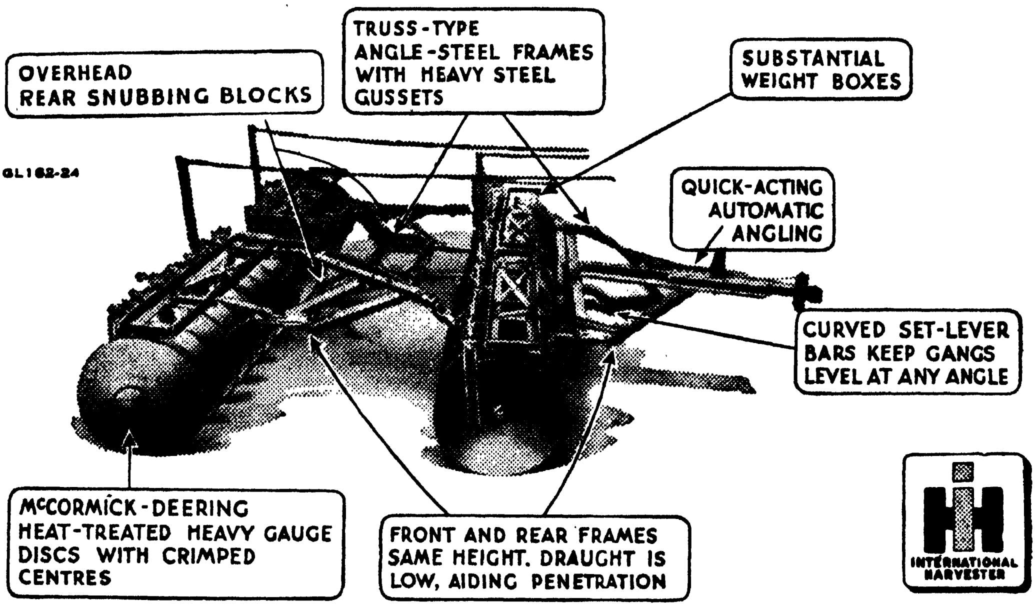
Competitor.	Individual Birds.						Group.
			White Leghorns—continued.				
Barton, J. H.	25.5	25.2	26.8	26.7	27.9	25.3	26.2
Biddle, W. R.	25.5	26.8	26.5	28.6	24.8	26.0	26.4
Bray, M. J.	26.1	24.0	26.4	25.9	25.2	*b*	*a*
Cameron, R. G.	25.6	26.8	26.2	24.3	24.9	26.2	25.7
Carpenter, H. B. ...	26.4	*a*23.9	25.2	24.5	25.2	26.4	25.3
Chidzey, H. T.	25.3	25.5	26.4	26.0	25.2	24.2	25.4
Christie, R. G., & Son ...	25.4	26.1	26.0	25.6	27.5	24.7	25.9
Cole, G. E.	25.5	24.9	25.1	26.2	*b*	27.1	*a*
Comyns, J.	25.7	28.1	27.4	26.6	26.7	26.9	26.9
Davies, A. H., & Son ...	25.9	25.2	27.5	26.8	27.1	27.2	26.6
Druce, R. W.	25.3	24.3	24.1	25.1	27.8	*a*23.0	24.9
Ellison, J. H.	26.6	26.7	24.3	25.5	25.7	*a*22.8	25.3
English, C. B.	26.3	24.2	25.8	24.3	24.3	27.1	25.3
Evans, C. D.	26.5	25.1	*a*23.4	26.4	25.7	24.9	25.3
George, A., & Son ...	24.9	27.8	25.6	24.4	*b*	24.7	*a*
Gilmore, N.	25.0	23.9	24.3	26.6	26.3	25.8	25.3
Graham, W. J.	26.6	28.7	24.5	28.0	26.9	27.6	27.0
Harris, E. & H.	25.5	25.3	25.2	*a*19.9	R	24.9	*a*
Hennessy, E. H.	25.7	25.6	26.4	28.1	24.5	*a*23.8	25.7
Hoe, W. H.	26.5	27.3	26.2	24.9	24.5	24.8	25.7
Holyoake, H.	26.4	25.5	25.9	25.6	26.7	26.4	26.1
Kahn, F.	24.1	26.5	25.7	29.0	27.9	25.1	26.4
Knott, W.	26.1	26.3	27.7	26.0	27.1	26.0	26.5
Knox, T. B.	27.4	25.7	24.8	25.5	25.7	24.9	25.7
Morrin, C. W., & Son ...	25.0	25.0	26.7	25.1	25.0	25.3	25.4
McDonald, M.	26.5	27.0	24.6	*a*23.6	24.0	25.5	25.2
McNamara, H. J. ...	26.3	24.1	26.4	26.8	24.9	*a*20.9	*a*24.9
Newman, L.	24.8	25.1	25.0	24.4	24.0	*a*23.4	24.5
Orange, G.	26.3	25.3	25.7	29.7	29.1	27.9	27.3
Packham, O. B.	26.2	25.3	25.6	25.8	24.8	26.6	25.7
Pearce, G. R.	27.5	24.5	24.8	26.2	25.3	*a*23.7	25.3
Pope, J., & Son	27.9	26.9	25.5	26.8	26.8	26.3	26.7
Power, F. H.	24.1	*a*23.5	26.9	25.8	24.5	24.5	24.9
Ranch, P. O.	26.1	26.9	27.1	26.5	26.5	26.2	26.6
Ray, F.	27.7	27.4	27.1	27.3	26.9	27.2	27.3
Richardson, L.	27.9	27.0	26.7	28.1	25.1	25.6	26.7
Riddle, Mrs. I.	25.6	26.2	26.4	27.1	27.5	24.6	26.2
Smith, F.	25.7	24.9	27.9	25.8	26.5	26.9	26.3
Soden, A.	24.7	25.8	27.2	24.8	25.0	25.8	25.6
Thoroughgood, R. ...	25.3	26.5	26.3	25.8	25.8	26.6	26.1
Wallace, A. F.	25.3	25.3	27.2	27.5	*b*	25.0	*a*
Warton, N. W.	25.9	24.8	24.3	25.2	25.3	26.0	25.3
Wilmott, W.	25.9	26.6	25.2	25.7	26.1	*a*23.3	25.5
Wimbleford Pty. Farm ...	24.6	26.4	25.0	26.4	27.2	26.9	26.1
Young, H. G.	25.8	26.4	26.1	25.6	26.9	25.2	26.0
			Anconas.				
Marr, W. L.	25.8	24.9	25.1	24.5	25.6	26.6	25.4

a Indicates bird ineligible for prizes owing to non-fulfilment of egg weight conditions.
b Indicates bird failed to lay required number of eggs during weighing period.
R. Bird replaced, weighing period not completed.

Painting the perches with creosote is a good safeguard against infestation with red mite, but it is sufficiently corrosive to cause burns to any part of the skin or comb of the birds with which it makes contact. For this reason it is a good plan to have a spare set of perches so that they can be painted and thoroughly dried before placing in the houses.



McCORMICK-DEERING Tractor Disc Harrows



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INTERNATIONAL HARVESTER

Entero-hepatitis or Blackhead in Poultry.

D. G. CHRISTIE, B.V.Sc., H.D.A., Veterinary Officer.

THIS disease causes serious losses in young turkeys and fowls in this State. Up to 100 per cent. mortality may occur in turkey poults and a figure of 50 per cent. mortality may be taken as average unless the outbreak is brought under control. Fowls appear to be less susceptible but mortalities of over 50 per cent. have been seen.

The Cause.

Blackhead is caused by a minute protozoan parasite, *Histomonas meleagridis*. This organism is easily killed by drying or disinfectants, but can survive for long periods encased within the eggs of the small round caecal (blind gut) worm (*Heterakis gallinae*).

Predisposing Factors.

This is a "filth borne" disease, and overcrowding, moist dirty conditions, and any conditions which permit contamination of food and water by droppings, are important predisposing factors.

The organism can be carried in the eggs of the caecal worm (*Heterakis gallinae*) which commonly infests adult fowls. Since turkeys are less likely to be infested with the caecal worm, the running of fowls with turkeys will predispose the latter to the disease.

While the organism causes blackhead in turkey poults in the absence of any factors which may lower the birds' resistance, fowls may harbour it without showing any symptoms of disease. Generally, it seems that in fowls, some predisposing factor must operate before the disease will occur. A common one is the generalised disturbance shown in birds following vaccination against fowl pox. This may occur at any time between the fourteenth and twenty-first days following vaccination, the birds being off their feed and showing a general upset for about forty-eight hours. It is conceivable that the effects of vaccination against infectious laryngo-tracheitis or round worm infestation could operate in the same manner.

White Leghorn Pullets Affected with Blackhead.

In this outbreak 20 per cent. of a large batch of pullets died

Blackhead has been associated with outbreaks of fowl pox and coccidiosis in causing heavy losses in young stock.

Method of Infection.

The organism is picked up by birds eating material contaminated with droppings passed out by affected or carrier birds. Experimental feeding with infected material caused the development of disease symptoms in four to nine days and death between the ninth and fifteenth days.

The caecal worm plays an important part in the transmission of the disease because the organism is passed out in the worm eggs and can survive in them for long periods. When birds eat worm eggs containing the organism, the disease is set up in fifteen to twenty-one days. The organism invades the caeca (blind guts) and spreads via the blood stream to the liver.

Susceptible Ages.

Turkeys are most susceptible when they "shoot the red" (when the caruncles are beginning to develop and redden) at about six to eight weeks of age—although on badly-infected ground they may be affected at three weeks of age. Older birds and even adult turkeys may be affected.

The disease affects fowls between four weeks (rarely younger) and six months of age (rarely older). From field observations White Leghorns appear more susceptible than the heavy breeds.

Resistance to the disease appears to increase with age, but one attack does not confer immunity against further attacks for more than about fifty to sixty days.

Carriers.

The recovered bird generally remains a carrier of the organism and constitutes a menace to younger and more susceptible birds. This applies particularly to fowls, which are more likely to remain carriers than turkeys and furnishes another reason for not running turkeys and fowls together.

Symptoms.

Both fowls and turkeys show similar symptoms. Affected birds "droop" and stand about "huddled up" with the head retracted.

Frequently young fowls show a faint leaden colouration of the skin of the face, and the comb and wattles (if developed) appear shrunken and pale. The plumage is dull and the shanks are pale in many cases.

In turkeys, the skin of the head and caruncles may be distinctly blackish or bluish (hence the name blackhead).

A sulphur-coloured diarrhoea is noted in less acute cases, while the droppings may be blood-stained in acute cases.

Post-mortem Appearances.

The caeca (or blind guts) show dirty yellow ulcers of varying size. Some may be deeply embedded in the intestinal wall and, at times, lead to perforation, peritonitis and death. At first the caeca are filled with a blood-stained mucus which hardens to form a blood-stained cheesy core. This cheesy core is laid down in successive layers like an onion.

The liver is commonly affected in turkeys, but less so in fowls. There are characteristic light yellowish, more or less circular, areas of dead tissue, ranging from pin point to one shilling in size, on the surface of the liver.

Confusion with Coccidiosis.

Coccidiosis may be confused with blackhead, and in cases where only blood-stained mucus is found in the caeca it may be necessary to carry out a microscopic examination to differentiate the two diseases. The yellowish areas on the liver and the cheesy plug showing successive layers in the caeca will usually be found in some birds, placing the diagnosis of blackhead beyond doubt.

Control.

When an outbreak occurs, transfer birds to a clean pen if possible, placing them on wire netting or in pens with smooth concrete floors which should be cleaned and washed down daily. Prevent contamination of feed and water troughs with droppings and employ every measure to improve sanitation.

Treatment.

Little reliance can be placed on the use of drugs in the treatment of sick birds, because in these cases liver damage has proceeded to such an extent that treatment can be of little avail. The organic arsenical drugs offer most promise as curatives, and should be given, not only to obviously

affected birds, but in-contact apparently healthy ones. They are unfortunately expensive. Sulpharsphenamine, neoarsphenamine, tryparsamide, mapharsen (mapharside) and acetarsol are examples of organic arsenicals which have been used with varying success. These drugs are sold under various trade names. Sulpharsphenamine is injected into the muscles at the rate of 0.005 gram per lb. of body weight in 0.1 ml. water and a second dose may be necessary twenty-four hours later. Acetarsol is given in tablet form by mouth, the dose for turkeys, three to six weeks old, being half a tablet at weekly intervals and for turkeys six weeks and over, one tablet every ten days.

There is a possibility that these arsenical drugs will be of value in outbreaks of blackhead in fowls following vaccination against fowl pox.

Prevention.

Emphasis should be placed on prevention rather than treatment. Do not run turkeys with, or on the same range as fowls and, if possible, spell ground run over by adult turkeys for at least twelve months before permitting young stock to occupy it. It follows that young birds should be raised apart from adults. Because of the possibility of hens or turkeys used for hatching acting as carriers, it is recommended that turkeys be artificially hatched and brooded.

Observe scrupulous cleanliness in the brooder house which should have either a wire netting or smooth concrete floor. Remember that the organism is microscopic and can easily be carried on boots, shovels, brooms, etc., from adult turkey or fowl runs. After the brooding stage place the poults on clean runs and make sure that every subsequent move is on to fresh ground.

Ipecacuanha wine is used as a preventive, but no conclusive evidence of its value is available. One fluid ounce is added to one gallon of water and this medicated water replaces the drinking water for twenty-four hours every week, commencing at one week old and continuing until the birds "shoot the red" (about eight weeks).

Phenothiazine is an effective remedy against the caecal worm. A dose of 0.5 gram per bird is given in wet mash and is sufficient for poults, adult turkeys, young and adult fowls alike; 1 oz. would be sufficient for sixty birds and 1 lb. for 1,000 birds.

In the case of fowls, it is important that all predisposing factors be given attention. If possible, rear birds on ground which has been spelled for at least twelve months from other stock. Keep young birds away from adults and treat for round worms if necessary before vaccinating against fowl pox.

Liver of a Turkey Affected with Blackhead.

Summary.

The disease is caused by an organism which can survive for long periods in the egg of the caecal (blind gut) worm.

Turkey poults three weeks to eight weeks old and fowls four weeks to six months old are most susceptible.

Sick birds "droop," "huddle up" and show a sulphur-coloured diarrhoea. Head becomes blackish in poults, while the face shows a leaden tint in fowls.

The caeca (blind guts) are plugged with a cheesy core of several layers and the liver may show yellowish areas.

Fowls may carry the organism and not show symptoms unless there are other predisposing factors. Recovered birds may remain carriers.

Prevention is better than cure. Keep turkeys away from fowls and young stock from adults. Move young stock on to runs spelled for as long as possible.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Devalion Stud, Castlereagh Rd., Penritn.
Bathurst Experiment Farm, Bathurst.
Boardman, C. M., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Cowra Experiment Farm, Cowra.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Gladesville Mental Hospital.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Nemingba State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Gosford Farm Home for Boys, Gosford.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Abortion-free Herds.

THE following herds have been declared free of contagious abortion (Bang's disease) in accordance with the requirements of the scheme of certifying herds abortion-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Armstrong, K. A., "Heathfield," Boorowa	23
Bathurst Experiment Farm (Guernseys)	28
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	22
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	188
Hawkesbury Agricultural College, Richmond (Jerseys)...	106
Hicks Bros., "Meryla," Culcairn	44
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53
Killen, E. L., Pine Park, Mumbil	60
McEachern, H., Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	75
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T, "Jerseymead," Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys) ...	49
New England University College, Armidale (Jesreys) ...	25
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn	80
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	24
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	276
Riverina Welfare Farm, Yanco	76
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	58
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	474
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	169
Training Farm, Berry	118
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Experiment Farm, Wagga (Jerseys)	52
Walker, Jas, R., "Strathdoon," Wolseley Park (Red Polls)	57
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	160
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Wollongbar Experiment Farm (Guernseys)	59
Yanco Agricultural High School	67
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	19
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	47
Cullen-Ward, A. R. "Mani," Cumnock	27
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	42
Forster, N. L., and Sons, "Abington," Armidale ...	62
Gladesville Mental Hospital	9
Kenmore Mental Hospital	49
Peat & Milson Islands Mental Hospital	72
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	57
St. Joseph's Convalescent Home, Kendall Grange, Lake Macquarie, via Morisset	18
Salway, A. E., Cobargo (Stud Jerseys)	62
State Penitentiary, Long Bay	69
Sydney Church of England Grammar School	24

W. L. HINDMARSH, Chief of Division of Animal Industry.

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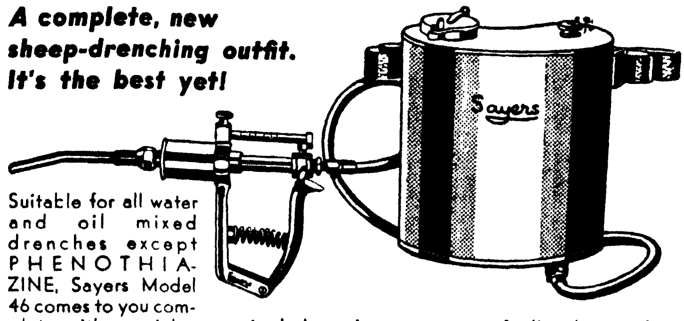

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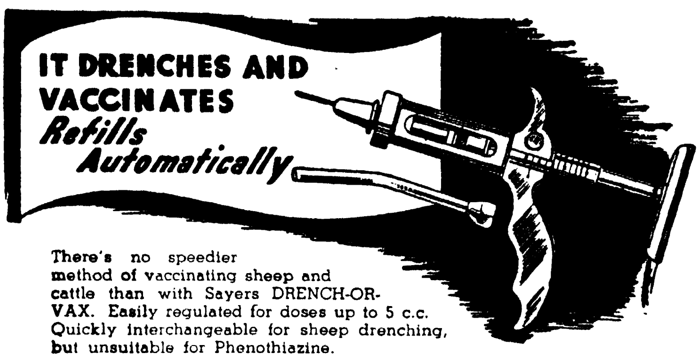
★ **Sayers 1 oz. AUTOMATIC DRENCHING GUN, Model 46, £6/8/6 complete**



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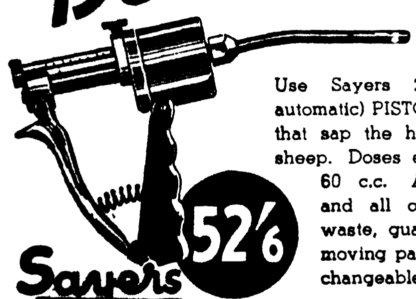

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Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.)	120	29/11/47
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	30/6/47
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Jerseys)	33	23/7/47
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/4/49
Cowra Experiment Farm (Ayrshires)	56	5/7/47
Department of Education, Yanco Agricultural High School (Jerseys)	64	1/3/47
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	3/3/48
Fairbairn, C. P., Woomargama (Shorthorns)	173	17/3/48
Farm Home for Boys, Mittagong (A.I.S.)	59	2/8/48
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	28/8/47
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	167	24/5/48
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Road, Young (Beef Shorthorns)	44	21/1/48
Hawkesbury Agricultural College, Richmond (Jerseys)	103	24/2/48
Hurlstone Agricultural High School, Glenfield (Ayrshires)	53	12/8/48
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	257	30/11/47
Killen, E. L. "Pine Park," Mumbil (Beef Shorthorns)	68	7/1/48
Limond Bros., Morisset (Ayrshires)	70	14/7/48
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	72	22/2/47
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	110	24/4/48
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80	26/6/48
New England Experiment Farm, Glen Innes (Jerseys)	51	11/4/48
New England University College, Armidale (Jerseys)	25	18/4/49
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	52	20/12/47
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	80	28/4/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	295	1/2/48
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	23/11/47
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	275	15/7/48
Richardson, C. E., Kayuga Rd., Muswellbrook	93	15/8/47
Riverina Welfare Farm, Yanco (Jerseys)	91	14/10/48
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	55	23/7/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112	18/9/48
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale	26	21/3/48
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170	21/2/48
Wagga Experiment Farm (Jerseys)	58	3/3/48
Weatherlake, J., "Bransome," Camden (Aberdeen Angus and Herefords)	5	14/3/48
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	119	20/4/48
Yanco Agricultural High School, Yanco	74	18/3/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	49	14/4/48
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	18	14/12/47
Brookfield Afforestation Camp, Mannus	209	12/8/48
Cameron, N., Montrose, Armidale (late New England Girls School)	39	28/5/48
Colly, A. C., "Heatherbrae," Swanbrook Rd., Inverell	32	11/8/48
Coventry Home, Armidale	11	29/9/48
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Ebsman Bros., Inverell	39	29/8/48
Emu Plains Prison Farm	122	21/3/48
Fairbridge Farm School, Molong	25	9/7/47
Forster, N. L., and Sons, "Abington," Armidale	62	24/5/48
Foy, F. J., The Valley Farm, Megalong Valley	25	18/12/47
Frizelle, W. J., Rosenstein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	36	22/9/48
Goulburn District Hospital	4	7/11/47
Goulburn Reformatory, Goulburn	8	11/6/48
Grant, W. S., "Monkittee," Braidwood	22	20/5/48
Hannaford, A., Braidwood	11	6/2/48
Harcombe, F. C., Hillcrest Farm Gum Flat Road, Inverell	60	30/6/47
Hopkins, E. G., Wattle Farm Guest House, Bargo	4	27/6/48
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	34	22/9/48
Kenmore Mental Hospital	52	26/6/47
Koyong School, Moss Vale	2	5/3/47
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lucas, L., "Braeside," Armidale	45	22/9/48
Lunacy Department, Callan Park Mental Hospital	43	4/4/47
Lunacy Department, Gladesville Mental Hospital	20	15/4/46
Lunacy Department, Morisset Mental Hospital	74	22/9/48
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department,, Rydalmere Mental Hospital	57	2/11/47
McMillan, N., Duval Road, Armidale	30	29/9/48
MacNamara, B., "Mount View," Cessnock	58	16/5/48
Marist Bros. College, Campbelltown	70	3/1/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	51	23/5/48
Murray, J. A., "The Willows," Keiraville	21	8/8/46
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	125	25/8/47
Peat and Milson Islands Mental Hospital	24	2/9/47
St. Ignatius' College, Riverview	27	14/8/48
St. John's Hostel, Armidale	6	24/6/49
St. Joseph's Orphanage, Kendall Grange, Lake Macquarie	9	11/6/47
St. Michael's Orphanage, Baulkham Hills	43	5/6/48
St. Patrick's Orphanage, Armidale	12	29/5/48
St. Vincent's Boy's Home, Westmead	33	9/7/48
State Penitentiary, Long Bay	13	30/11/47
Stephenson, W. J., "Hill View," Fig Tree	53	10/2/48
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Tubercle-free Herds—*continued.*

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Bombala Area.
Inverell Area.
Braidwood Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

B.H.C. (Benzine Hexachloride) as a Blowfly Dressing—*continued from page 660.*

satisfactory kill of the old maggots which escape from a strike following treatment. An attempt is now being made to develop a B.H.C. blowfly dressing which will give a high per cent. mortality of maggots in the strike at the time of treatment or prevent the maggots from producing normal flies. Since the compatibilities of B.H.C. with certain materials are not fully known, there may be some delay before blowfly dressings containing it are available commercially.

References.

[1] WATERHOUSE, D. F. (1947), C.S.I.R. (Aust.), Bull. No. 218.

[2] SHANAHAN, G. J. (1946), *Agr. Gaz. N.S.W.*, Vol. 58, p. 546.

Flock Management during Shearing.

Care of Lambs and Ewes.

SPECIAL thought should be given during shearing to ewes with lambs at foot. Dry ewes and wethers present little trouble so long as it is seen that they get sufficient food and water, but the case with ewes with lambs is different. It is important that they be treated with extra care.

The mixed farmer may have perhaps 1,000 to 1,500 ewes with lambs at foot running in his flock, and the time taken for shearing, employing only one or two shearers, may be in the vicinity of a fortnight. The chief worry of the owner is to see that the lambs do not receive a check through being separated from their mothers and that the ewes are not starved or kept in the shed more than can be helped. To avoid this it is recommended that the flock be brought up to the shed in sections. If a paddock is entered while the sheep are grazing (not on the camp) no difficulty will be experienced in cutting off a section without the lambs becoming separated from their respective mothers.

In all circumstances it is necessary to separate ewes and lambs for shearing. In the event of the lambs being shorn at the general shearing and not at a special lamb shearing, the lambs and ewes could be put through in alternate runs or as convenient. Ewes and lambs must be shorn separately for three reasons:—(1) For the protection of the lambs; (2) for the convenience of counting out after shearing; and (3) on account of the different method employed in handling lamb's wool. Too much stress cannot be laid on the last, as in the event of lamb's wool becoming mixed with ordinary fleece wool the value of the fleece lines will be considerably reduced.

The ewes should be given every opportunity to graze during shearing time, always remembering, however, that unnecessary drafting is to be avoided. It is not advisable to bring sheep that are "full" straight on to the shearing board, as they are uncomfortable while being shorn and have a tendency to kick.

Heavy losses are frequently reported from turning sheep out in cold inclement weather. The animals principally affected are poor sheep, and very fat sheep, but if sheep are turned out sufficiently early to have an opportunity to fill their stomachs before the sun goes down conditions have to be very severe for losses to occur. It is therefore advised, assuming the space is available, that any sheep shorn during the last run should be shedded. If no shed room is available they should be put in a stack yard or a well timbered paddock in order that all the shelter and warmth possible may be afforded. Many owners purposely avoid clearing a small area adjacent to the shed in order that they may have such a paddock for shorn sheep.—SHEEP AND WOOL BRANCH.

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